THE REFINER AND NATURAL GASOLINE MANUFACTURER

LIBRARY

Regular Features

Recent Patents of Interest to Plant Men
Extracts From Refinery Technology
Refinery and Gasoline Plant Activity
New Equipment for Refineries and Gasoline Plants

Vol. 4 No. 8 AUG., 1925 $1.00 Per Year

Physical Examination Required For Plant Operators

By Grady Triplett

Traffic Department Helps Keep Customers "Sweet"

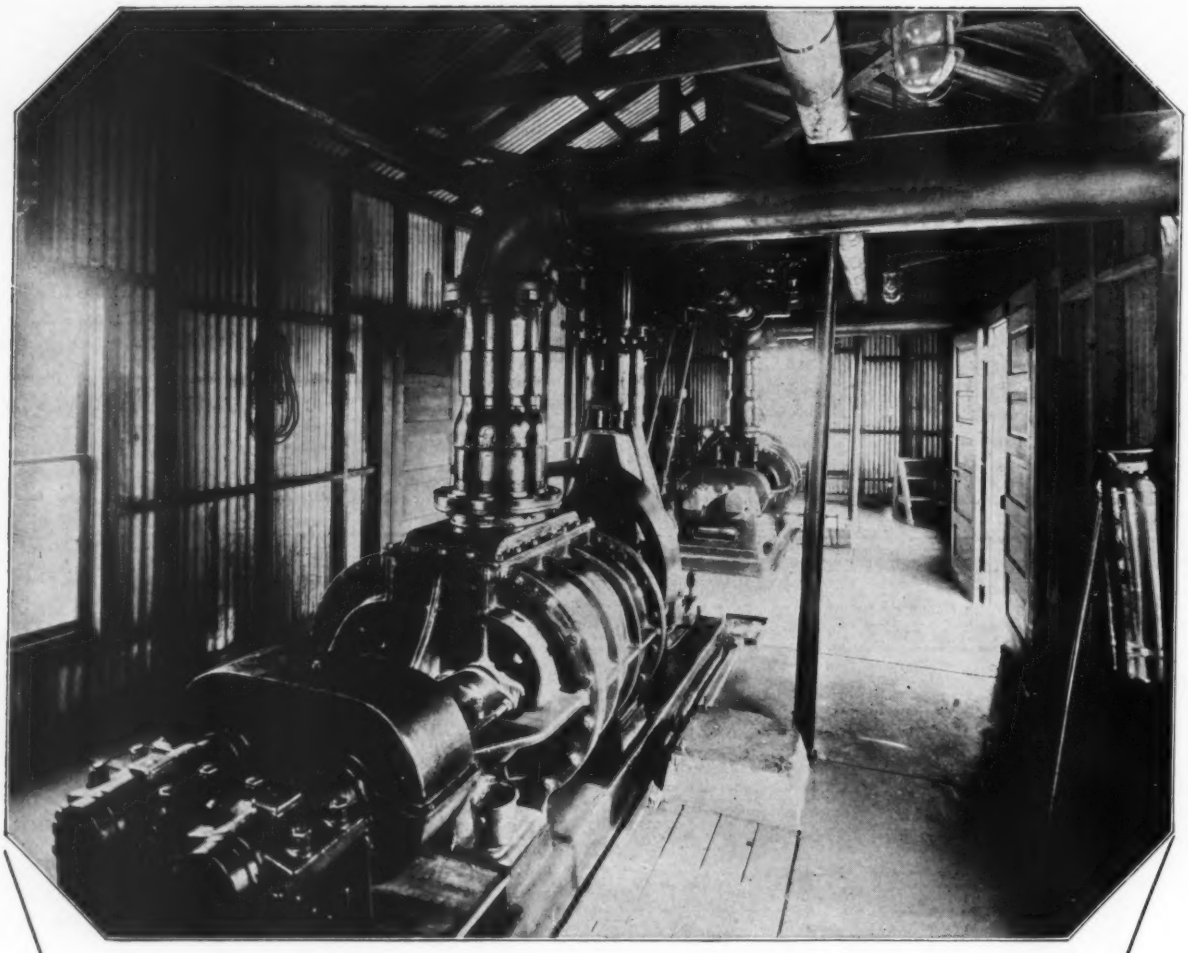
By H. H. King

Expansion Methods of Refining Described By Inventor

Sand Blasting Tank Cars for Painting Proves Big Economy

By A. R. McTee

Natural Gasoline Association Committees to Meet in October—Fuel Oil—Its Uses and Methods of Analysis—Fire Wall Construction for Oil Storage Tanks



Advantages Gained by Use of Roots Gas Pumps

Roots Positive-Pressure Rotary Gas Pumps or exhausters are ideal for gathering uncondensed vapors. They can handle large volumes of gas, hold the run down lines under a vacuum of one and four inches of water, and discharge at a pressure high enough to force the gas through the sulphur scrubbers.

The Huntoon Governor will regulate pressure accurately. At any change in refinery conditions—such as variation in the production of gas—the pump will automatically decrease or increase its speed to keep the vacuum on the gathering lines constant. Thus little attention is required and constant service guaranteed.

Roots Rotary Gas Pumps will give constant service 24 hours a day without danger of shut-down. One refinery reported only one delay in eight years' time due to accumulation of sulphur in the walls of the Pump.

Bulletin 108 tells you more. Write for it.

Pump House at the Comar Oil Co., Tonkawa, Okla., showing Roots Rotary Gas Pumps in service.

Write for Bulletin 118 of Engineering Tables. It is very valuable to every refinery engineer.

The P.H.&F.M. ROOTS CO.

DEPT. 10

CONNERSVILLE, IND.

Chicago Office — **130 S. Michigan Ave.**

New York Office — **Room 800-120 Liberty St.**

Entered as second class matter June 16th, 1923, at the Postoffice at Houston, Texas, under the Act of March 3, 1879.

(245)

Here's What Happens When Rust Gets A Chance

A tank roof honeycombed with rust holes—evaporation losses many times multiplied—early repairs, if not a gauger drowned, or replacement of the entire roof.

That's why you should paint the underside of your tank roofs.

Back of Degraco Tank Paints stands the integrity of the maker—thirty-five years of close contact with paint problems. A definite knowledge of the service conditions to be met and how to meet them are the basic reasons for their wide and successful use in the oil industry.

You can bank on Degraco Paints to cut down corrosion losses.

DEGRACO PAINTS

All Colors for Your Particular Needs

MADE BY

Detroit Graphite Company

512 Twelfth Street

DETROIT U.S.A.

NEW YORK
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ST. LOUIS
SAN FRANCISCO

TAMPICO
HOUSTON
KANSAS CITY
PHILADELPHIA

PITTSBURGH
LOS ANGELES
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Company Name
Address
State
Detroit Graphite Co.
512-12th. St.
Detroit, Mich.

DEGRACO PAINTS ARE SOLD THROUGH BRANCH OFFICES WITH WAREHOUSE STOCKS IN ALL PRINCIPAL CITIES

MANUFACTURED IN CANADA BY DOMINION PAINT WORKS, LIMITED, WALKERVILLE, CANADA

Tell them where you saw the ad.

We have only one basis of licensing the Dubbs Cracking Process and that is absolutely and strictly on the merits of its performance

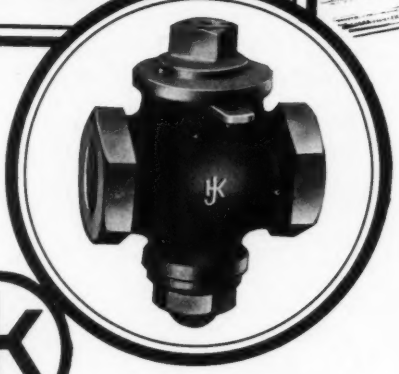
We have no concessions to offer—no influence to exert, excepting only the influence of the good reputation of the Process, producing more good gasoline at lower cost per gallon than is otherwise possible today

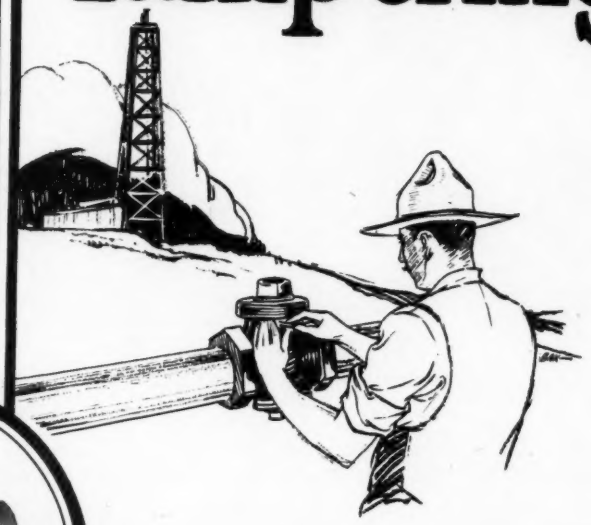
Universal Oil Products Company
Owner of the Dubbs Process
310 South Michigan Ave
Chicago, Illinois

Safeguard *against* Tampering!

Upper—Fig. 491, Essex Lock Iron Cock, Extra Heavy Pattern.

Right—Fig. 490C, Essex Lock Iron Cock, Light Pattern. Threaded end of key has large oval end projecting beyond nut which allows key to be loosened with blow of hammer or wrench without damaging thread.





There's no room for argument, misunderstanding or underhand work if your lines are protected by Essex lock pattern Iron Cocks. Only those authorized and possessing keys can operate these valves. Any standard padlock may be used.

These valves are typical of the complete line of valves and fittings made available for the oil country by one of the country's largest manufacturers of quality products. Be sure to specify K & J.

Write for Catalogue "S" listing and illustrating complete line

Power Plant Piping, Coils and Headers of all kinds made at our Etna plant, Sharpsburg, Pa. Write for booklet.

THE KELLY & JONES CO.

Manufacturers of

Dependable Valves & Fittings for all Pressures and Purposes

WORKS - GREENSBURG, PENNA.

BRANCH STORES AND OFFICES { NEW YORK - PITTSBURGH - CHICAGO - CINCINNATI BUFFALO - ST. LOUIS - SAN FRANCISCO.

ESSEX LOCK PATTERN IRON COCKS

Tell them where you saw the ad.

Rarin' to Go!

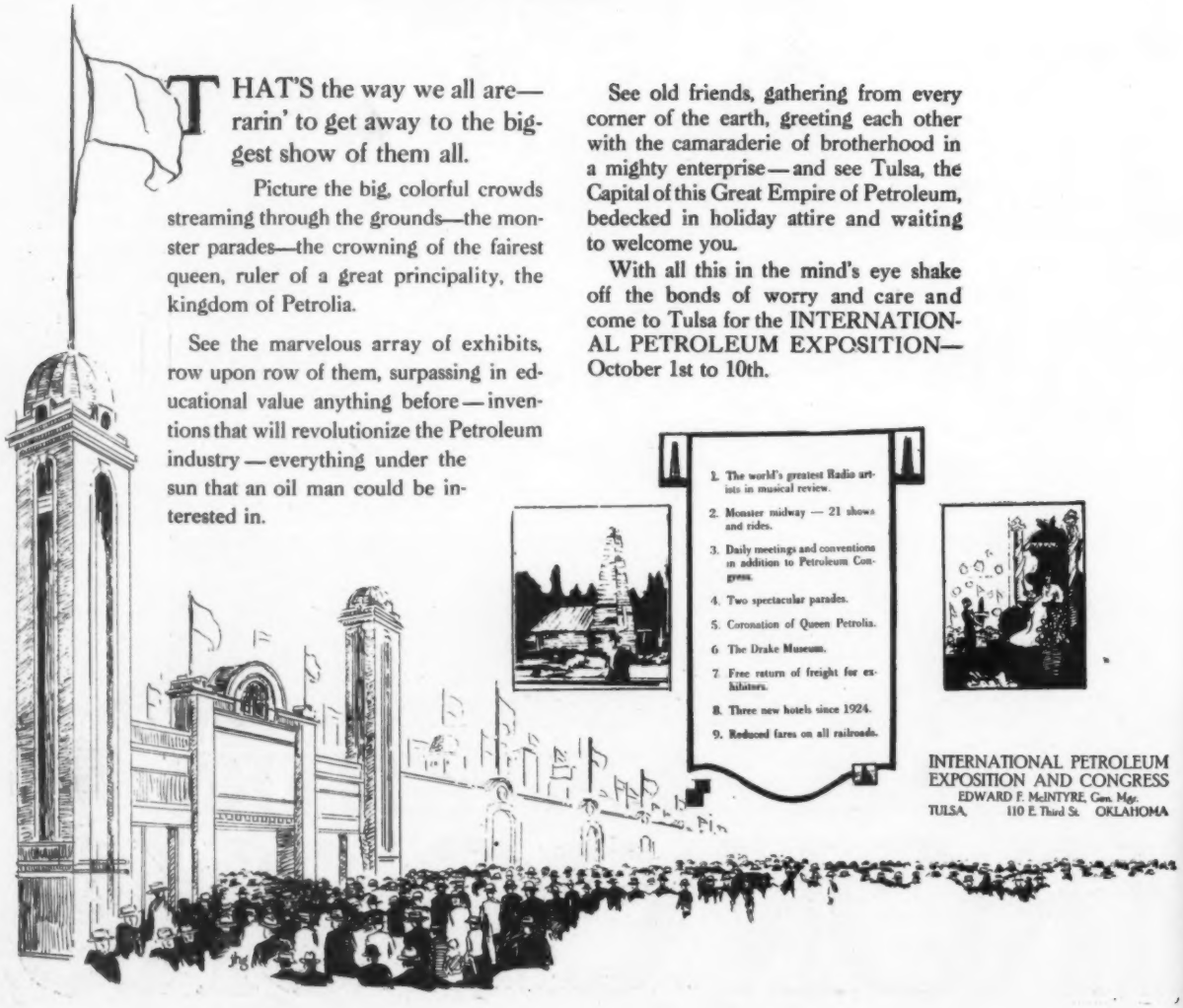
THAT'S the way we all are—rarin' to get away to the biggest show of them all.

Picture the big, colorful crowds streaming through the grounds—the monster parades—the crowning of the fairest queen, ruler of a great principality, the kingdom of Petrolia.

See the marvelous array of exhibits, row upon row of them, surpassing in educational value anything before—inventions that will revolutionize the Petroleum industry—everything under the sun that an oil man could be interested in.

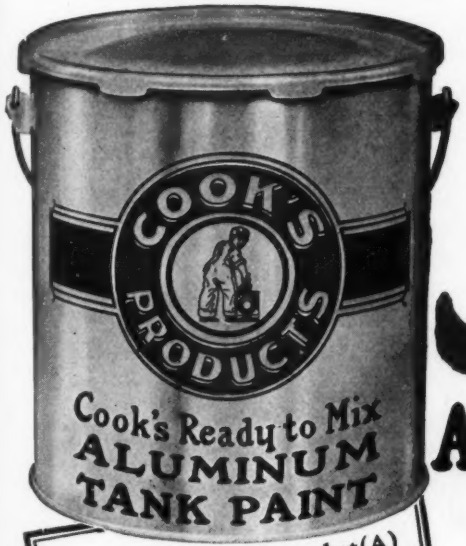
See old friends, gathering from every corner of the earth, greeting each other with the camaraderie of brotherhood in a mighty enterprise—and see Tulsa, the Capital of this Great Empire of Petroleum, bedecked in holiday attire and waiting to welcome you.

With all this in the mind's eye shake off the bonds of worry and come to Tulsa for the INTERNATIONAL PETROLEUM EXPOSITION—October 1st to 10th.



1. The world's greatest Radio artists in musical review.
2. Monster midway — 21 shows and rides.
3. Daily meetings and conventions in addition to Petroleum Congress.
4. Two spectacular parades.
5. Coronation of Queen Petrolia.
6. The Drake Museum.
7. Free return of freight for exhibitors.
8. Three new hotels since 1924.
9. Reduced fares on all railroads.

INTERNATIONAL PETROLEUM EXPOSITION AND CONGRESS
EDWARD F. McINTYRE, Gen. Mgr.
TULSA, 110 E. Third St. OKLAHOMA



Cook has pioneered again, this time with a

fresh
READY-TO-MIX
ALUMINUM TANK PAINT

Powder in the Small Bucket (A) Liquid in the Large Bucket (B) Together in a 5-Gallon Package

The large bucket "B" contains the Liquid and a separate bucket "A" which contains the Aluminum Powder. Remove the lid of the large bucket and take out the smaller Bucket containing Powder. Cut out the soft tin top of Bucket "A" and dump the Powder into the Liquid. Stir well with a wide, flat paddle that is long enough to reach the bottom of the large bucket.

Mix It on the Job as You Use It—

This *fresh* mixture gives a bright, shiny paint of superior quality, containing exactly the proper proportions of Powder and Liquid. Science has taught us that Aluminum Paint must be freshly mixed to be most effective. This unique Cook package assures *easy, foolproof mixing.*

Now, in this ***new*** and ***unique*** package, you may buy Aluminum Tank Paint that is sure to be ***fresh.*** Because it ***is*** fresh, it has greater "leafing power", it wears better, and it reflects light and heat most effectively.

Science has proved that Aluminum Paint, to be most effective, must be applied when freshly mixed. It has remained for the Cook Paint and Varnish Company, pioneers in the manufacture of paints for the oil industry, to devise a paint package which assures ***easy and foolproof mixing.***

When you use Cook's Aluminum Tank Paint, you get Liquid and Powder in exactly the right proportions, ready to mix. It is bright, shiny, ***new*** paint—with a covering capacity of 750 square feet to the gallon. The greater leafing power of the fresh Aluminum "seals in" the paint, giving maximum wear and maximum heat reflection. One coat will do the work. It may be applied with either brush or spray.

As an undercoat, use Cook's Rust Inhibitive Primer. It prepares the surface so that less Aluminum Paint is required; and firmly anchors paint to metal.

For dado work on tanks, use Cook's Steel-Kote, the toughest paint film known. It spreads farthest, covers better, wears longer. Preserves steel and prevents rust.

Cook Paint and Varnish Company

Pioneers in the Manufacture of Specialized Paints for the Oil Industry

Factories: Kansas City and Fort Worth

8 Warehouses for Quick Shipments in the Mid-Continent Field: Omaha, Wichita, Oklahoma City, Tulsa, Dallas, Denver, Fort Worth, Kansas City.

Fight Sunshine with Cook's Tank Paint —Save 200 Barrels Yearly, Per Tank!

Government field tests on 55,000-barrel crude oil storage tanks show that Aluminum-painted tanks lose by evaporation 200 barrels less oil in a year's time than black tanks.

Black tanks absorb the heat from the sun's rays, causing excessive evaporation. Aluminum-painted tanks *reflect* the sun's rays, and thus remain cool. It's cheaper to paint a tank than to lose 200 barrels by evaporation!

Mail This Coupon Today for Cook's

Special Introductory Offer

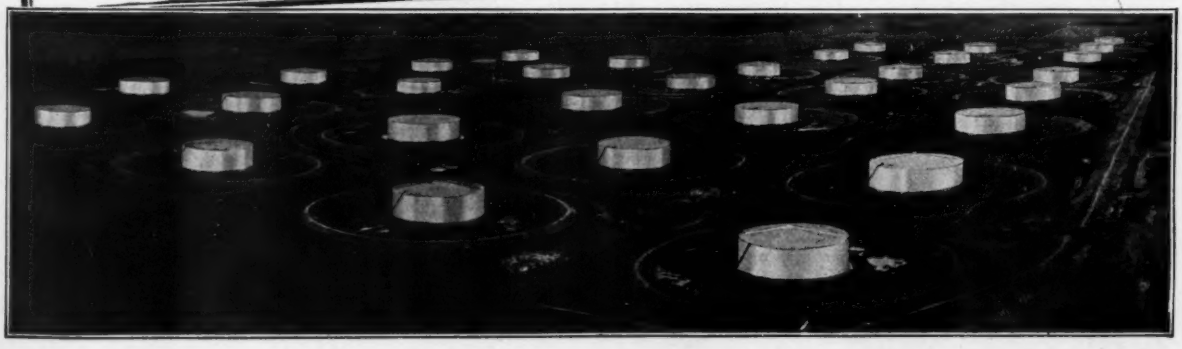
Cook Paint and Varnish Company, Oil Industry Service Dept.
1319 Grand Avenue, Kansas City, Mo.

Gentlemen: Please send me full details of your Special Introductory Offer on Cook's Ready-To-Mix Aluminum Tank Paint, in the new 5-gallon package. Also send me information regarding your Rust Inhibitive Primer and Cook's Steel-Kote. I (have) (have not) seen your booklet "Cook's Paints for the Oil Industry". Please send me a copy.

Company Name.....

Individual To Address.....

City and State.....



Tell them where you saw the ad.

SCHUTTE KOERTING

Save Heat

The excess heat in the residue leaving stills can be utilized to heat the incoming crude oil with

SCHUTTE HEAT EXCHANGERS

Ask Heat Transfer Dept. for Bulletin 12-H

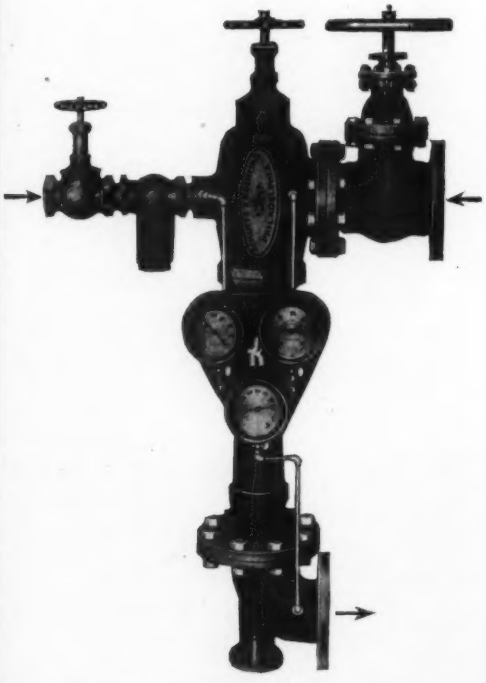
Two-barrel Heat Exchanger

Save Steam

Eliminate reducing valves, reduce consumption of live steam, utilize exhaust steam, and obtain low pressure steam for oil stills by installing

SCHUTTE THERMO COMPRESSORS

Ask Jet Dept. for new Bulletin 4-F



Steam Jet Thermo Compressor

SCHUTTE & KOERTING CO., 1253 N. 12th St., PHILADELPHIA, PA.

Tell them where you saw the ad.

MATHIESON Chemicals

AMMONIA—Aqua, 26°

IN line with our increasing production and to better serve consumers, we are steadily expanding our distribution facilities on Aqua Ammonia, 26°.

Warehouse stocks are now established at the following points:

Atlanta, Ga.	Fort Smith, Ark.	New Orleans, La.
Baltimore, Md.	Knoxville, Tenn.	New York City
Buffalo, N. Y.	Lynchburg, Va.	Philadelphia, Pa.
Charlotte, N. C.	Memphis, Tenn.	Providence, R. I.
Chattanooga, Tenn.	Nashville, Tenn.	Richmond, Va.
Fairmont, W. Va.	Newark, N. J.	St. Louis, Mo.

As rapidly as our growing volume of business warrants, we will add new warehouse stocks at other distributing centers. We are also prepared to make prompt shipments from our works at Niagara Falls in any quantity up to carload lots. Mathieson Aqua Ammonia is supplied in standard 110 gal. drums and 8,000 gal. tank cars.

We solicit inquiries from oil refiners and will be glad to give quotations and full information regarding our product.

The MATHIESON ALKALI WORKS Inc.
250 PARK AVE. NEW YORK CITY
PHILADELPHIA CHICAGO PROVIDENCE CHARLOTTE

Caustic Soda ~ Liquid Chlorine
Bicarbonate of Soda
Anhydrous Ammonia

EAGLE THISTLE PRODUCTS

Soda Ash ~ Bleaching Powder
Modified Virginia Soda
Aqua Ammonia

Deal Direct with the Manufacturer

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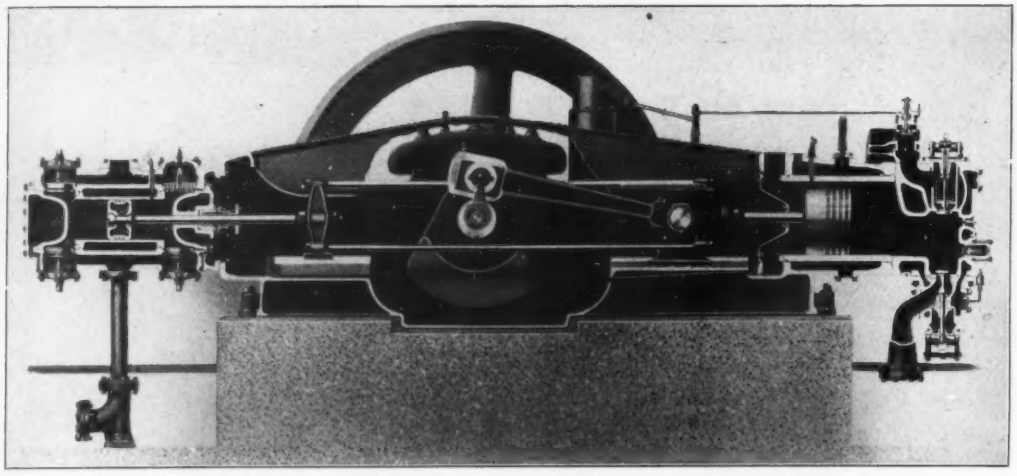

Black Diamond Gasoline chooses Cooper engines!

You would expect an engineer like R. W. Thomas to install Cooper Engines in a gasoline plant where every engineering detail will represent the last word in gasoline plant construction.

The new absorption plant which he is building for the Black Diamond Gasoline Co. north of Ranger, Texas, will have seven 160 B. H. P. Cooper Gas Engines direct driving Cooper compressors.

Whenever an engineer is progressive enough to include the very latest refinements in his gasoline plant construction you will often find him using Cooper Gas Engines and Cooper Compressors. Either his own experience or the experience of so many others has proven that for economy and continuous operation nothing will compare with them at any price. Yet because of the large number built they cost but little more than the cheapest.

THE C. & G. COOPER COMPANY

MT. VERNON, OHIO

1605 Kirby Bldg., Dallas

504 Kennedy Bldg., Tulsa

Bank of Italy Bldg., Los Angeles

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The REFINER and NATURAL GASOLINE MANUFACTURER

EDITED MONTHLY AT TULSA, OKLAHOMA

GRADY TRIPLETT, *Editor*

Published by

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HOUSTON, TEXAS

R. L. DUDLEY, *President* A. L. BURNS, *Gen'l Mgr.*

Volume 4 AUGUST Number 8

For men engaged in the operating branch of the refining and natural gasoline business

Price.....$1 per year

Advertising rates upon application to nearest office

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Why Build? Buy a Plant

If a first reading of the proposal L. V. Nicholas has made that jobbers of the Middle West construct a refining plant of their own, brings a smile and a chuckle, the refiners of the Mid-Continent and other sections may reflect on the fact that the aggressive president of the National Petroleum Marketers Association is a doer of things.

It requires no very great amount of nerve for a bunch of men to subscribe the money for constructing a refinery. That has been done in the past, scores of times. There has been a lull in recent years but that is no indication that it will not be done again, scores of times.

In his weekly bulletins President Nicholas has much to say about sound economics. One of his contentions is that gasoline run through skimming plants to sell for 13 cents a gallon is in competition with cracking plant gasoline, costing 7 cents a gallon.

Whether his figures are correct to the penny or not is a question for debate. Undoubtedly, however, the growing use of cracking units is having much to do with prices and markets. So President Nicholas is walking on firm ground when he singles out cracking as the keystone of the refining industry.

But how he can claim to be on sound economical ground when he proposes to build additional refining capacity, where too many stills exist already is a mental contortion not easily followed.

May 1, according to the Bureau of Mines, the United States had crude oil still capacity of 2,864,842 barrels. Of this, 2,511,817 barrels were in operation, leaving 342,025 barrels shut down. At that time 11,000 barrels of capacity was under construction.

Refineries are shut down for many reasons. But that 342,025 barrels of cold still capacity May 1 was evidence of the fact that the refining capacity of the petroleum industry in the United States was over built.

If over built then, it is over built now, for refinery runs have decreased since May 1 and indications are they will not move upward again this season.

President Nicholas makes the point that the skimming plant is the source of economic loss. On that score, he could answer that this type of refinery is over built but that the truly economical plant, one with cracking units, is not over built.

That is the sort he would have jobbers build. But he need not build a plant to get one with cracking units.

There are score of plants for sale at this time and if the predictions of still lower market come true, there will be other plants for sale. If they do not have cracking units, it is an easy matter to add them.

The jobbers of the Middle West, if they are serious in their desire to control a refinery, need not build. They can go out and buy a plant already running, or one shut down and awaiting fire and charging stock. They can add all the cracking units they want and have a complete refinery in shorter time and no doubt at less cost than by building.

Furthermore, they will not be tying more load on an animal that is overloaded already.

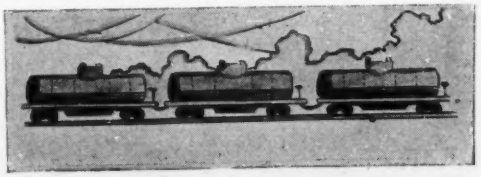
As the addition of cracking units is made to existing refineries, the capacity for the United States increases in double fashion. Cracking units leave a plant equipped to care for a greater bulk of crude oil each day. Then they extract a higher per cent of gasoline from the crude oil.

There is no sound economy in building additional refining capacity when the industry is in a sluggish condition, part of which has been caused by excess capacity. There is soundness in converting a plant that is not equipped to show a profit into a plant that can show a profit.

But the oil industry has not heard the last of the Nicholas proposal for a refinery or several refineries controlled by the jobbers. If the intention is to build these plants, the refining branch of the industry is not going to profit thereby.

If the jobbers of the Middle West want to contribute something of value to the whole industry, they can have one or a dozen plants to convert into manufacturing establishments of their own liking.

For plants are available. Chances are that offers to sell have already reached Chicago.



Stop Fires and Prevent Evaporation

Improved—Standardized

As a result of more than two years' experience in building the Wiggins floating roof we have improved this remarkable device to the point where it is practically standardized in construction. Its performance is dependable; its results are sure.

The Wiggins roof today is a standard piece of equipment with us. It is furnished in diameters to fit your tanks. We fabricate, ship and install ready to operate. The day it is placed in operation it starts paying you dividends.

A Successful Record Behind It

This roof has in every instance of northern installation gone successfully through the last severe winter without a hitch or any trouble whatever. The bad sleet storm in December did no damage. Snows in January caused no trouble. Rain and ice and cold weather did not prevent these Wiggins roofs from operating day after day at their work of paying evaporation dividends and preventing fire.

What It Is

Think of it as the cover of a large tin can turned upside down and floating on the surface of oil placed in a can a trifle larger in diameter. Add the seal, which seals this open surface between the floating roof proper and the shell of the tank, and you have essentially all there is to this remarkable device.

What It Does

The roof blankets the surface of the oil. Therefore there can be no evaporation. Because there is no evaporation there is no accumulation of gasoline vapor present as is the case under a canopy roof. Therefore, by eliminating evaporation we also eliminate the hazard of explosion and almost entirely eliminate the fire hazard.

TEAR OUT AND MAIL TODAY

Chicago Bridge & Iron Works,
2124 Old Colony Building, Chicago, Illinois.

GENTLEMEN: Please send me quotations on Wiggins Roofs for the following locations:

Location ..... Diameter .....

Location ..... Diameter .....

Location ..... Diameter .....

Name .....

Company .....

Address .....

440

Ideal for Fire-Prevention

Because it supplies a permanent fire- resistive blanket which covers the oil, the Wiggins floating roof is ideal for preventing fires.

Pays for Itself

On a rundown tank the Wiggins roof will pay for itself in four or five months. On pipe line gathering tanks it will pay for itself in less than six months. On main line pipe line tanks it will pay for itself in seven to twelve months. These figures are based on ten-cent gasoline, certainly a conservative average figure.

Will Save You Money

Your tanks are no exception. They are losing money for you every day unless they are equipped with this floating roof. The air space above the oil in a canopy-roof tank is a standing invitation to the gasoline vapors to pass off the oil and be lost to you forever. It is the best part of your oil that you lose in this way.

Two roofs in service two years have saved by actual test enough to pay for themselves completely every six months!

Fire Safe!

Blanketing oil has long been known as the way to put out a fire. But until this roof was invented there was no way to blanket the oil until after the fire started.

The Wiggins roof locks the barn door before the horse is stolen; it places the blanket over the oil before the fire can start. It eliminates the explosion hazard entirely.

No Operating Difficulties

The roofing is simple in construction. There are no difficulties in operation. Drainage is provided in one of two ways which we have perfected. Water drains off automatically. The roof raises and lowers with the surface of the liquid without any outside help.

Ask for Quotations on Diameters You Need

The next thing you will want to do is to have our nearest office quote you upon the diameters you want to install. Fill in the adjoining coupon and mail it today. You will want to take off some old wooden roofs (which carry a high insurance premium) and install the Wiggins roof on some of your working tanks to stop the heavy evaporation losses that exist there.

Even if you don't want to request quotations today you will want to get your copy of the 28-page Wiggins bulletin.

CHICAGO BRIDGE & IRON WORKS

CHICAGO 2124 Old Colony Building — NEW YORK 3144 Hudson Terminal — DALLAS 1638 Praetorian Building — SAN FRANCISCO 1050 Rialto Building

Tell them where you saw the ad.

Physical Examination Required for Skelly Plant Operators

The superintends holds the key position in application of this part of safety program

By Grady Triplett
Staff Representative

BEFORE a man is given permanent employment in one of the natural gasoline plants of the Skelly Oil Company he must have a physical examination. This practice applies to employment throughout this company but as here treated only the manufacturing of natural gasoline will be considered.

This physical examination requirement is part of the safety program of the company. It is one of the methods by which men are selected to fill positions for which they are fitted. Other phases of safety work are concerned with teaching men how to perform their duties in a manner that will eliminate accidents, while the physical examination is for revealing defects which might brand a man as unfitted for a certain work, regardless of how much safe practice he may be taught.

The physical examination, however, is not a means by which men are prevented from having employment. It is rather a method by which men are given proper employment. Often men apply for one type of work, only to learn, following the physical examination, that it would be unwise for them to be given such work. Instead some other line of work is recommended.

How Applied

An example along this line is heart trouble. When the examination reveals a weak heart, it is known by company officials that the man should not be given two types of work. He should not be subjected to extreme heat, as around a refinery or a gasoline plant. Neither should he be required to do any climbing, such as gauging tanks or climbing towers. But heart trouble does not hinder men from doing other work. A man so afflicted is never given duties of the two classes above.

For temporary employment, there is flexibility in the application of the physical examination requirement. Employment of seven days is allowed without the necessity of the examination. This allows superintendents to recruit common labor for work of short duration without the handicap of having to wait for a report from the physician and perhaps from the insurance department at the home office in Tulsa.

Regardless of the nature of the work, the physical examination is required for a permanent connection in the natural gasoline department of the Skelly Company.

As practised by this concern, no company physician is required, although company officials believe one would be preferable, were there sufficient work to keep him busy. The Skelly Company has physicians designated in several localities of the Mid-Continent area. He is supplied with

TO YOUR INTEREST

At the April meeting of the Association of Natural Gasoline Manufacturers, a paper on Safety in Gasoline Manufacturing by C. L. Swim of the Skelly Oil Company aroused an interest that developed into beneficial discussion.

The question of physical examinations for plant employes was brought out. Apparently it is new to the making of natural gasoline, for few concerns reported its use.

This article presents the method by which the Skelly Company conducts the physical examination part of its safety program.

—The Editor.

Form N150—4-25—2M

SKELLY OIL COMPANY

No. 1754 ----------

Dr. ----------

Please physically examine ----------

the bearer of this request, who is an applicant for employment in the capacity

of ----------

In your recommendation as to whether applicant should or should not be employed, please bear in mind the employment contemplated.

Superintendent.

THIS COPY TO BE RETAINED BY PHYSICIAN

The superintendent gives a man two copies of this form for presentation to the physician, who gives the physical examination

Form H140—2M—4-25—Henry

SKELLY OIL COMPANY

MEDICAL EXAMINER'S REPORT

Nº 2663

Examination of _____ (Last Name) _____ (First Name) _____ (Middle Name)

Address _____

Examined at _____ the _____ day of _____, 192__

THE MEDICAL EXAMINER is requested to make a most thorough examination, to answer each question fully, and to write the result of the examination himself. He must not permit any third person to be present during the examination. When completed, the original report should be returned to the superintendent who requested the examination, the duplicate report should be mailed to the Insurance Department of the Company at Tulsa, Oklahoma.

Does applicant belong to Caucasian Race?_____ If not, what race? _____

At what point is employment contemplated? _____

What is nature of employment? _____

What is general appearance? _____ Age? _____ Height? _____ Weight?_____

1. (a) Is applicant afflicted with any contagious or communicable disease? _____
   (b) If so, what? _____
2. Venereal Disease? _____
3. Hernia? _____
4. Hydrocele? _____
5. (a) Varicose veins? _____
   (b) If yes, state whether minor or serious _____
6. (a) Varicocele? _____
   (b) If yes, state whether minor or serious _____
7. (a) Skin eruptions? _____
   (b) If yes, state whether minor or serious _____
8. Are glands enlarged? _____
9. Indicate below result of urine analysis.
   (a) Positive _____
   (b) Negative _____
10. Is there any sign of insanity or nervous affection? _____
11. Has the applicant any serious bodily malformation, lost a limb, an eye, or suffered serious physical impairment from mechanical injury, or disease? _____
12. Do you think there is any danger of development of any disease that would render applicant unfit for service or constitute a menace to other employees? _____

13. What is the condition of teeth and gums? _____
14. (a) Is there any impairment of sight? _____
    (b) If so, to what extent? _____
15. (a) Is there any impairment of hearing? _____
    (b) If so, which ear and to what extent? _____
16. (a) Are lungs diseased? _____
    (b) If so, to what extent? _____
17. (a) What is condition of heart? _____
    (b) Blood pressure: Systolic _____ Diastolic _____
18. Are reflexes normal? _____
19. (a) Does applicant have flat feet? _____
    If so, degree: Slight _____ Serious _____
20. Do you believe applicant to be temperate? _____
21. Is there evidence of successful vaccination? _____
22. (a) Is there any serious physical defect other than shown above? _____
    (b) If so what? _____
23. (a) In your opinion is the applicant physically fit for employment in the capacity contemplated? _____
    (b) If not, please explain fully under "remarks".

Remarks: _____

_____ M. D., Examining Physician.

Address _____

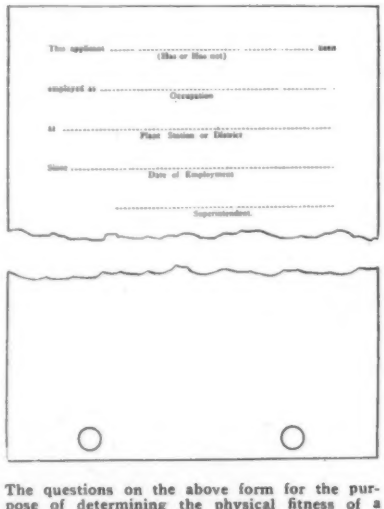
a set of examination blanks and is paid a fixed fee for each examination he completes. His methods and his work are similar to that done by the physicians who make examinations for life and fraternal insurance companies.

Up to Superintendents

The plant superintendent is the pivot for the physical examination in the Skelly Company. It is part of his duty, in employing a man to see that he is given the physical examination. Usually he is the only person to talk with a prospective employe before sending the man to the physician for an examination. So he is conscious of the fact that he must use good judgment in determining to send a man for an examination, for the findings of the physician may reveal that the man can not be employed.

All this compels the superintendent to be cautious in selecting men. He seeks to find reasons that might prevent employment before he makes his preliminary step of sending the man to the physician.

Nothing in the method of employment can give the prospective employe the impression that he is being selected by any other person except the superintendent. The man goes to the superintendent for work. An interview follows. If the superintendent thinks it advisable, he gives the man an order, with instructions to go to a physician for an examination. But he must come back to the superintendent for a decision, his return being based on the completion of the physician's examination.



The questions on the above form for the purpose of determining the physical fitness of a man for the particular line of work he is seeking in the Natural Gasoline Department of the Skelly Oil Company. Below is the reverse side of the form which furnishes information on the applicant's past experience.

Keeps Feeling Good

This makes for good feeling on all sides. The superintendent is allowed to do his own hiring, with the knowledge that it is subject to the check of the insurance department. The employe comes to the plant, knowing he is under the supervision of the superintendent, for the superintendent is the only official with whom he had dealings leading up to employment. Then the superintendent knows he is not being ignored in the matter of selecting his operating force at the plant.

In rare cases, a superintendent may hire a man whose record of the physical examination does not look good in the insurance department. But in a case of that sort, the procedure is such that good feeling is maintained. If such a record comes to this department it is called to the attention of the executive in charge of that department, the natural gasoline department in this instance. The executive of this department can then take the matter up direct with the superintendent.

Checking Up

But the employe is never aware of the fact that the judgment of his superintendent has not been approved at headquarters. In most of the cases of this class, the superintendent has been able to show good reasons for selecting a man, despite an unfavorable report from the physician.

Should a conference of this sort, department executive, plant superintendent and a representative of the insurance department being its members, result in a decision to not keep the employe, the fact is carried to the employe through the superintendent. The other men serve in advisory capacities in the selection of plant operators.

Winning Them Over

By giving the plant superintendent this key position in the physical ex-

amination method of selecting men, one of the objections expected for the system was overcome. On introducing the system, where it had not prevailed, it was feared opposition might be met from both superintendents and from employes of long service. As company officials wanted to escape any such situation, they sought means of gaining the favor of both superintendents and plant operators.

The plan was presented to the superintendent as a method by which he would be able to recruit a more competent staff of plant operators. He was told not to look on the new plan as one designed to make his job harder.

"Your value to the company depends on your ability to show a profit," went the reasoning.

"A plant workman, subject to accidents or not physically fit for a task, is a handicap to profit making. He is like sorry equipment.

"Through the physical examination we'll be able to select better men and your value to the company will be increased, because your plant will show a lower accident and compensation payment record."

Willing Workers

The result of this educational work is that the plant superintendents are heartily in favor of the physical examination requirement for employment in the Skelly Company. They know it is working to their advantage, for accidents have been lessened and payment through compensation insurance have been reduced.

When the plan of examination is not working properly, the plant superintendent is a willing worker to correct the fault. In a few instances physicians have not been thorough in their examinations. The method of correcting this in the Skelly organization is to get the plant superintendent in that district to check up on the physician. To do this he will be compelled to go over all the examination records he has. Furthermore, he will have to talk with his employees about their examinations. From these he can learn how the physician is performing the duties given him.

Showing the Men

There is a letter on file now at the Skelly headquarters, where a plant superintendent checked up on a physician and did his job so well that he could inform the insurance department in just what particulars the physician was negligent.

The company has few cases of this sort. When they happen, a conference with the physician usually corrects this condition. But the company can change physicians in a district, and will do it when conditions warrant.

When the physical examination requirement went into effect, the company had scores of men, most of them plant operators of long experience and good records for the company. Introduction of something new involved the possibility of causing dissatisfaction among these men. That had to be overcome, for the physical examination as used by this company is not for the purpose of keeping men from having work, but rather to make sure that they have proper work.

It was decided to require men of less than a year of employment to take the physical examination. Those with the company longer than a year were not required to have the examination, as officials believed their records were sufficient for basing a decision to keep them at their present work.

Objections Few

So the plant operators were approached like this:

"This examination is to protect you. You do not want to work with men who have contagious or infectious diseases. A man may have such a disease and not know it. That man does not care to hold this danger over his fellow employees. Then some of you may be doing work for which you are not physically fitted. This examination is just to correct such conditions."

It was made clear that the examination would not result in men being discharged. They were told that any man found in improper employment would be transferred to some line of work fitted for his physical condition.

No more than half a dozen men left the Skelly Company on account of the physical examination requirement. And officials noted that men leaving on this account were in most instances undesirable for other reasons. So far as disrupting the working forces of plants, the physical examination just removed a few men undesirable on other grounds.

With the physical examination in effect, employees of the company now look upon it with high favor. Some request it, asking that any defects be brought to their attention, so they can be corrected. This is the condition most desired of the work.

Paper Work Small

Only two printed forms are necessary in carrying out the physical examination. There is a "request form," the smaller one, shown herewith. This is printed in triplicate and is kept by the plant superintendent.

When he has decided on accepting a man, he fills in one of these forms, giving the man the original and duplicate copies, the third remaining in his book. The prospective employee takes the two copies to the physician of the district.

These are authority for the physician to conduct an examination. Forms of the medical examination report are in the hands of each physician. He conducts the examination as indicated by the questions on this form.

The examination report is made in duplicate. The physician mails the original back to the plant superintendent and mails the duplicate to the insurance department of the Skelly Company at Tulsa. So the prospective employee never sees the result of his physical examination. He must return to the plant superintendent for a final word on whether he is to be employed or not.

Back to Superintendent

When the plant superintendent has made his decision, using the physical examination as a basis, he fills in the lines on the back of the original copy of the physical examination report and mails it to headquarters. There it is checked in the insurance department and the job is done.

Since safety work was introduced by this company, accidents and expenses involved therein have been reduced in the natural gaoline department, of which Emby Kaye is superintendent. The physical examination is to some extent responsible for this.

In the first six months of 1924 there were 38 injuries that caused loss of time in the natural gasoline plants of the company. These accidents cost the company in compensation insurance $3,700, and resulted in a loss of time totaling 1,035 days.

In the corresponding period for 1925, only 14 accidents serious enough to cause loss of time have happened in natural gasoline plants of this company. Their compensation cost has been but $413, and the total loss of time only 79 days.

It should be explained that the first six months of 1924 included considerable construction work in the natural gasoline department of this company, while the first six months of 1925 included but little construction.

But the record is such that the physical examination as well as the whole safety program are considered a part of the permanent policy of the Skelly Oil Company. Safety work is under the direction of C. L. Swim.

In following our desire to give readers and advertisers every possible advantage from trade paper service, Grady Triplett, editor of THE REFINER AND NATURAL GASOLINE MANUFACTURER, has moved his headquarters to the Tulsa office of the Gulf Publishing Company where he will be able to maintain an even closer connection with the industry than in the past. All future issues will be edited from that office and we will be at home to our friends, editorially, at 215-16 Atco Building, Tulsa, Oklahoma. Subscriptions, advertising and all matters pertaining to the business part of the publication will continue to be handled from the company's headquarters at Houston, Texas.

Natural Gasoline Association Committees To Meet In October

Tulsa, Okla. — Committees of the Association of Natural Gasoline Manufacturers will meet for a general conference during the International Petroleum Exposition here October 1 to 10. The date has not been decided. This conference will be the first of its nature since the naming of the committees of the year. The committee memberships have been filled by E. L. Peck, president of the association, and general manager of the Empire Gasoline Company.

Several of these committees are functioning. Matters pertaining to their work have come up for consideration and the chairmen have called the members for meetings of this nature.

One special committee named during the association meeting in April has made its report, which will be passed along to the whole membership for ratification, after it has been passed on by the executive committee. This committee was named to work out changes in the constitution and by-laws. The most important change recommended is that of adding a board of directors to the organization.

At present the association has an executive committee. The change would allow a board of directors, from whose membership an executive committee will be selected. It is this proposed change that will be put to the membership for approval.

The committees that have been named by President Peck follow:

Membership Committee.—A. M. Ballard, Sun Oil Company, chairman; D. E. Buchanan, Chestnut & Smith Corp.; E. R. Lederer, Texas Pacific Coal & Oil Co.; James B. Weir, Falling Rock Cannel Coal Co.; Frank L. Chase, Lone Star Gas Co.; F. S. Wade, Lomita Gasoline Co.; Kenyon L. Reynolds, Pacific Gasoline Co.; O. W. Crick, Highway Oil Refining Co.; H. G. Ellis, Amity Gasoline Co.; John W. Hurley, Hurley Gasoline Co.; W. C. Mullalley, Arkansas Fuel Oil Co.; J. A. Farrerty, Carbide & Carbon Chemicals Corp.

Gas Testing Committee. — A. J. Schlosser, Barnsdall Oil Co., chairman; O. S. Ambrose, Tidal Refining Co.; H. W. Harts, Amerada Petroleum Corp.; Ray Short, Prairie Oil & Gas Co.; E. C. Lefevre, Empire Gasoline Co.; George P. Bunn, Phillips Petroleum Co.; J. H. Boyle, Chestnut & Smith Corp.; J. J. Thomas, Skelly Oil Co.; Elmer Schmidt, Lone Star Gas Co.; W. A. Melton, J. A. Hull Company.

Tank Car Committee.—C. C. Meadows, chairman; Tidal Refining Co.; A. C. Holmes, Empire Refineries, Inc.; C. H. McBirney, Transcontinental Oil Co.

Sales Managers Committee.—H. A. Trower, Phillips Petroleum Co., chairman; B. E. Blankenship, Pulaski Oil Co.; A. F. Garrett, Tidal Refining Co.; A. F. Wood, Chestnut & Smith Corp.; M. S. Patton, Hurley Gasoline Co.; S. B. Crooks, Empire Gasoline Co.; R. R. Rosier, Akin Gasoline Co.; R. P. Humes, Transcontinental Oil Co.; F. W. Burford, Skelly Oil Co.; J. von Carlowitz, Texas Pacific Coal & Oil Co.

Patent Rights and Process Committee.—F. L. Chase, Lone Star Gas Co., chairman; C. G. Mechling, Tidal Refining Co.; R. M. Coyle, Chestnut & Smith Corp.; G. G. Oberfell, Phillips Refining Co.; E. C. Lefevre, Empire Gasoline Co.; R. R. Dean, Waite Phillips Co.; R. R. Owens, Marland Refining Co.

Specifications Committee.—John M. Hall, Oil State Refining Co., chairman; Lloyd F. Bayer, Tidal Refining Co.; A. F. Wood, Chestnut & Smith Corp.; E. R. Lederer, Texas Pacific Coal & Oil Co.; J. R. Jarvis, Lone Star Gas Co.; George P. Bunn, Phillips Petroleum Co.; S. B. Crooks, Empire Gasoline Co.

Technical Committee.—F. E. Rice, Phillips Petroleum Co., chairman; C. R. Barton, Tidal Refining Co.; R. M. Coyle, Chestnut & Smith Corp.; E. F. Schmidt, Lone Star Gas Co.; G. M. Davidson, Empire Gasoline Co.; R. R. Dean, Waite Phillips Co.; John M. Hall, Oil State Refining Co.; T. N. Gohdes, Texas Pacific Coal & Oil Co.

Meters and Regulators Committee.—Ray Short, Prairie Oil & Gas Co., chairman; Ted Hall, Tidal Refining Co.; J. R. Jarvis, Lone Star Gas Co.; D. C. Williams, Marland Refining Co.; George Baird, Empire Gasoline Co.; George P. Bunn, Phillips Petroleum Co.

Gas Contracts Committee.—J. H. Boyle, Chestnut & Smith Corp., chairman; M. T. Kirk, Phillips Petroleum Co.; O. S. Ambrose, Tidtal Refining Co.; O. J. Berend, Skelly Oil Co.; E. C. Lefevre, Empire Gasoline Co.; F. C. Hall, The Henderson Co.; R. R. Dean, Waite Phillips Co.

Traffic Committee.—A. F. Winn, Skelly Oil Co., chairman; C. F. Dowd, Tidal Refining Co.; F. E. Burke, Chestnut & Smith Corp.; C. R. Musgrove, Phillips Petroleum Co.; S. B. Crooks, Empire Gasoline Co.; H. C. Mulroy, Marland Refining Co.; W. W. Klingsmith, Transcontinental Oil Co.

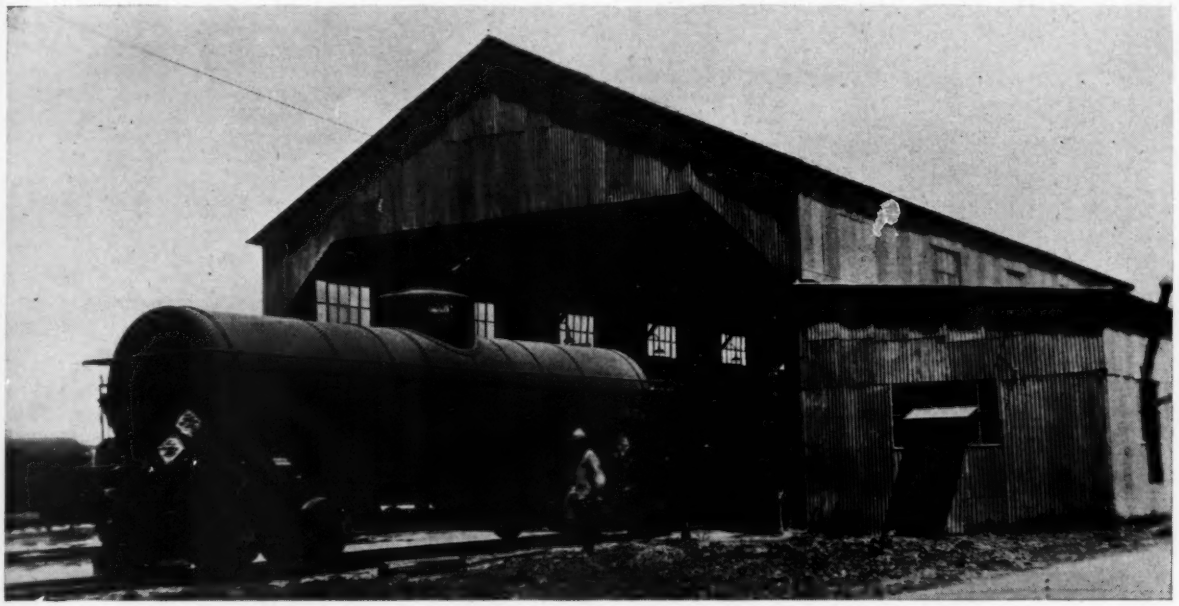
Gas Residue Committee.—Lloyd F. Bayer, Tidal Refining Co., chairman; J. H. Boyle, Chestnut & Smith Corp.; M. T. Kirk, Phillips Petroleum Co.; G. M. Davidson, Empire Gasoline Co.; M. E. Mockley, Amerada Petroleum Corp.

California Company Will Operate Texas Gas Plants

Ft. Worth, Texas.—Two natural gasoline manufacturing plants are being erected by the American Gasoline Corporation of Los Angeles, California in East and Central West Texas fields, and gas contracts are now being taken for one or more plants in the Panhandle District of Texas. This concern is the distributor of the Newton process on the West Coast, and is to make use of this process in all of its plants in Texas. George C. Wents is president of the company, with headquarters at Los Angeles, and the other officers follow: E. B. Warner, vice president; George W. Woolley, secretary; and J. H. Wents, treasurer. Thomas Bryan is to be the superintendent in charge of Texas plants, and present plans are to open a district office in Ft. Worth.

The American Gasoline Corporation is completing its first natural gasoline plant in Texas near the town of Necessity in lower Stephens County. This plant will be supplied with gas affording an average yield of one gallon per thousand cubic feet, and is equipped to handle eight million cubic feet daily. It will cost approximately $60,000, and is scheduled to start operating about the middle of August. Construction work has begun on a 12,000,000 cubic foot capacity plant on the Fuller Oil Corporation acreage in the Waskom field, near the Texas-Louisiana line. The Waskom plant will represent an expenditure of $75,000, with a gasoline yield amounting to approximately three-quarters of a gallon per thousand. The plant is to be placed in operation by September 1.

Edwin N. Carlson has been promoted to the land department of the White Eagle Oil & Refining Company and will have headquarters in Wichita, Kansas. He was formerly chief scout for the company. His place is to be filled by T. M. Cady, who has been a statistician for the company for the past 18 months.



Painting shed where the car work at the Humble Oil and Refining Company's Baytown refinery is done.

Sand Blasting Tank Cars for Painting Proves Big Economy

Humble Oil & Refining Company workman devises machine used at Baytown refinery

By A. R. McTee
Staff Representative

BY using a sand-blasting outfit designed by one of its own men and made in its own machine shop at Baytown, Texas, the Humble Oil & Refining Company has cut the time required for painting tank cars in half. Two men, with the help of the blasting outfit, can now clean and paint a car in two days, whereas before the blasting outfit was used, four days or longer were necessary. An average of 100 cars are painted at Baytown each year. Therefore, the yearly saving in time alone amounts to 200 days. Expressed in terms of dollars and cents, the saving amounts to the salary of two men for 200 days.

The big saving in time comes in cleaning the cars before the paint is put on. Formerly each car was cleaned by hand. This took fully two days with two men working. The car had to be scraped with metal brushes and then rubbed clean or washed with gasoline. This was tedious work and could not be rushed.

In their efforts to economize on the work, those in charge decided to try the sand blast in cleaning the cars. A few factory-made oufits were tried, but did not give entire satisfaction. One of the men in the tank car repair department then devised a sand-blasting machine which gave good results from the start, and has been in use for about two years.

This outfit is simple in construction and is inexpensive. It consists of a strong metal cylinder big enough to hold between 300 and 400 pounds of sand, constructed to withstand air pressure of at least 150 pounds. This cylinder has an intake connection for air and an outlet connection for the sand hose. Proper valves control these openings. A reinforced steam hose one and one-half inch in diameter is fitted on to the sand outlet and conveys the sand to the spray nozzle. This nozzle is nothing more than a ⅜-inch gas pipe fitted into the steam hose. The reduction to ⅜ inch assures sufficient force for the sand to cut the paint when blown onto the car. The nozble or pipe through which the sand is blown onto the car is the main wearing part of the outfit. From three to four of these are necessary for cleaning one car. However, these nozzles are cut and threaded in the shop at Baytown and cost very little. The hose through which the sand passes wears slowly, and 17 or 18 cars can be cleaned with one 50-foot length of hose. One length of air-line hose will last indefinitely.

Pressure from the air line is released into the sand container and blows onto the sand from the top. This forces the sand through the hose and nozzle to the car. Pressure on the sand should be at least 125 pounds, and faster and better work can be done with 150 pounds. Below 100 pounds nothing can be done with the outfit; the sand will not cut.

In this connection it is obvious that the man operating the sand-blast must be protected. Anything that will cover his face and hands will suffice. The Humble Company has a sort of mask which is provided, with a glass for the operator to see through. This outfit fits over the head and shoulders and hangs loose about the waist. Heavy gloves protect the operator's hands.

Experience at Baytown has taught that when a car is cleaned it is better to empty the journal boxes of all packing before using the sand blast. Then when the car is clean, the boxes are cleaned carefully and repacked. This eliminates the danger of sand getting into the boxes. If a cover is used to keep the sand out, there is danger of the sand sifting in and causing damage when the car is put on the road.

The importance of thoroughly cleaning tank cars before any coat of paint is applied cannot be over-emphasized, in the opinion of the Humble paint men; the success of any kind of paint depends upon the condition of the surface to which it is applied.

One of the biggest problems that the Baytown men have to fight is dampness. To begin with, the climate there is damp; the refinery fronts on

Newly painted tank car showing the kind of work done at the Humble Oil and Refinging Company's Baytown refinery paint shop.

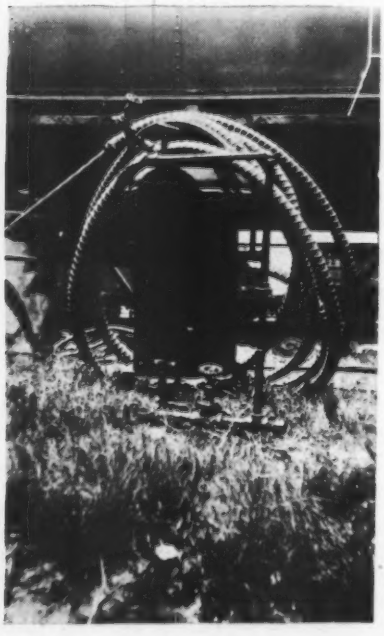
the bay and gets the full sweep of the salt breeze. These facts make it imperative that all precaution be taken to have the surface of the cars dry before any paint is put on.

Sand Must Be Dry

A special apparatus is used to dry the sand used in the cleaning equipment. This consists of two wooden vats set up in a room where the sand is kept. One of these vats has a series of screens in the bottom, ranging from a comparatively large to a very small mesh. A steam coil is fitted between these screens and as the sand is being screened, it is also being dried. By the time it passes through the last screen it is thoroughly dry. It is taken from a container then and put into the other vat where it is kept until used. Care must be taken not to get the sand too hot, for if this happens it loses its cutting qualities and goes to dust when pressure is applied to it.

For cleaning a tank car of all paint thoroughly, between 700 and 800 pounds of sand are required. However, most of the cars at Baytown only have to be rough cleaned, and this takes between 300 and 400 pounds of sand. Once in a while a car is in such condition that the full amount of sand has to be used.

When the car is clean, one coat of tank car paint is sprayed on the frame. Usually this is all the frame gets. If it is corroded to any extent, two coats will be applied, but this is seldom the case.



The sand blasting outfit used by the Humble Oil and Refining Company at its Baytown refinery paint shop.

Tank Painted by Hand

The upper part of the car is painted by hand and gets two coats.

No primer is used by the Humble Company, except on cars that are insulated.

About five gallons of paint are required to the car. One coat is applied one day and allowed to dry over night. The second coat is put on the following day.

The painting is usually done under a shed provided there is room. The same shed is used for repair purposes and oftentimes rush repair jobs have to be done. When this is the case the painting is done in the open.

All lettering is done with the aid of stencils.

A special brand of tank car paint made by the Kuhn Paint and Varnish Company, Houston, Texas, is used on all Humble Oil and Refining Company cars.

No definite figures can be given as to how long one painting will last. This depends upon where the car goes. However the average life of one painting is two years.

The sprays used in painting the frame of the tank cars were made by the same man who devised the sand blast and cost very little.

To Deepen River

With the dredging of the Neches river to 30 feet in depth, the Magnolia Petroleum Company will be able to load larger cargoes at its wharves at both its plants near Beaumont. At present vessels are loaded to draw from 25 to 27 feet of water. The government has been petitioned to dredge the stream.

Moving Plant

Los Angeles, Calif., June 20.—The Associated Oil Company's old topping plant in the eastern part of Los Angeles, which has not been in operation for many months, is being dismantled and will be re-erected on the company's Watson tank farm. It is understood the plant will be renewed to some extent and that gasoline will be run.

Paint sprays in use at the Humble Oil and Refining Company Baytown refinery paint shop.

Another Jenkins Installation

The Wilhoit Refining Company of Springfield, Mo., has contracted with the Graver Corporation, East Chicago, Indiana, for the installation of a 1000 barrel standard unit Jenkins cracking process.

C. L. Reeder, manager of the Oil Equipment Department of the A. Y. McDonald Manufacturing Company, is visiting a number of Canadian cities in the interests of his company. His trip will include Winnipeg and probably Regina, Saskatchewan. He will also visit Minneapolis, where his company maintains a branch. Mr. Reeder plans an extensive Eastern trip in the near future which will take in New England points, New York, Baltimore, Washington, and Richmond.

Fuel Oil—Its Uses and Methods of Analysis

THE use of oil fuel is now becoming general in all trades and industries the majority of which, were up until a few years ago, entirely dependent upon coal.

The two greatest means of travel, ocean and railway traffic, have derived especial benefit from liquid fuel.

1. Actual saving effected in initial cost of fuel.

2. Reduction of bunkerage or tender space, which in ocean traffic may be used for additional cargo, and in railway traffic permits carrying more water.

3. Reduction of stokehold force.

4. Elimination of dirt and dust.

5. Saving of time in bunkering.

6. Greater energy efficiency due to elimination of necessity of drawing fires, and from a naval standpoint there is increased radius of action, the ability to bunker while at sea and underway, and the important ability to raise steam in a very short space of time.

Most of the newer warships of the leading naval powers are equipped for oil fuel, some of the larger ships carrying about one million gallons.

Advantages of Oil

A very important feature in the use of oil fuel for naval ships is in the fact that the ship may be fired hard without emitting any smoke or if necessary produce its own smoke screen by pouring out dense clouds of black smoke.

In railroad use the consumption per 100 ton miles in weight of fuel is half as great for oil as for coal. Steam may be raised with oil fuel to working pressure in 50 per cent of the time required for coal. One of the greatest considerations, however, in passenger traffic is the elimination of soot and cinders as any traveler will testify.

Oil fuel is now used in furnaces for case-hardening and annealing, forging, rolling, in glass making and extensively for furnaces for hotels, buildings, laundries and homes.

There are now upon the market some very good types of oil installations for small furnaces, which may be safely used in homes, the temperature being controlled from the various rooms by thermostats. These installations are quite economical as they generate heat rapidly and when the desired temperature is reached, the fuel shuts off automatically until the temperature starts to drop when the fuel is turned on.

Oil on the Sea

A very good illustration of the value of liquid was demonstrated before the London Oil Congress of 1912 by Mr. L. J. Kermode.

Mr. Kermode stated that in the case of S. S. Mauretania, a fast vessel of 68,000 H. P., 25 tons of coal per hour is required, or about 5500 tons for the trip between New York and British ports, and he shows that 3300 tons of liquid fuel would perform the same amount of work 5500 tons of coal would, saving 4700 tons weight of fuel a round trip.

As the liquid fuel could be carried in the double bottom, a vast amount of cargo space would be released for freight, which would mean a great increase in earning power.

He also pointed out that on account of the necessity of drawing about 15 per cent of the furnaces every watch to remove clinker, etc., the aggregate energy of the power plant was reduced from 68,000 to 58,000 H. P. Thus by the use of oil the steam raising capacity of the ship would be increased by at least 15 per cent as there would be no drawing of fires necessary.

The above would apply in the same manner to a stationary power plant.

Source of Fuel Oil

A large percentage of fuel oil is available without distillation, the straight crude being used, it is generally necessary however to remove the more volatile products in order that the fuel may be safe.

Heavy fuel is much more economical than light, as the residues of various crude oils varying in gravity from 12 to 35 Baume, and in heating value from 18,000 to 19,700 B. T. U. per pound.

The greatest demand for petroleum is as fuel, comparison of this representing about 50 to 60 per cent the total consumption.

Comparison of Fuel Oils

	Be. Grav.	B. T. U. Per Lb.
Towanda Fuel Oil	22.1	19,187
Mexican Fuel Oil.....	30.0	19,466
Electra Crude	38.5	18,734
Healdton Fuel	23.9	19,242
Electra Fuel	24.0	19,217
Texas Crude	20.1	19,225
Mexican Crude	18.3	19,154
Mexican Fuel	15.3	18,505
Mexican Fuel	14.7	18,200

A good example of first-class heavy fuel is Mexican fuel, the B. T. U. per pound is lower than that of, for instance, Electra crude, but is higher per gallon. This applies to all light fuels, and as fuel oil is sold by the gallon or barrel, the heavy fuel is by far the most economical.

Fuel Values

	Grav. Be.	B.T. U. per lb.	B. T. U. per gal.	B. T. U. per bbl.
Electra Crude	38.5	18,734	129,920	5,456.40
Gas Oil	30.0	19,466	142,202	5,976.484
Mexican Fuel ..	14.7	18,200	146,765	6,164.130

Comparing the Mexican fuel with the crude, the Mexican fuel yields 707,490 more B. T. U.'s per barrel, or a clear saving of 38.87 pounds of fuel per barrel, which is equivalent to 4.8 gallons per barrel, in other words, 42 gallons of Mexican fuel is equal to 46.8 gallons of the crude or 43.3 gallons of the gas oil.

This fuel will therefore effect a saving of 1.14 barrels per 100 barrels consumed.

Fuel Oil Practice

The carbon dioxide content of the stack gases from an oil furnace should be about 15 per cent. Stack height may be 40 per cent less for oil fuel than for coal.

One pound of oil fuel requires about 200 cubic feet of air for complete combustion.

Greater burner efficiency may be obtained by using burners for the purpose for which they are designed.

Specifications

It is difficult to draw up a set of specifications generally covering uses for fuel oil. For the point of use and individual necessities require different qualities of fuel oil as regards viscosity, flash, etc. High sulphur fuel may be used freely for all steam generating purposes and generally with the possible exception of metallurgical processes.

Specifications are a necessary feature and a thorough study should be made so as to intelligently make specifications covering specific requirements suited to the individual case.

The United States and British specifications for heavy fuel oil are identical, and those published by the United States navy follow:

Specifications—governing the purchase of fuel oil by the United States Government, Navy Department, Washington, D. C.

Fuel Oil:—Meeting the requirements of the Navy when derived from American crude or from Mexican crude or from a mixture of the two, will be considered.

Quality and kind of oil should be fully described in the bid, together

(Contiued on page 46.)

Traffic Department Helps in Keeping Panhandle Customers "Sweet"

By H. H. King
Staff Representative

THE systematic use of card forms and index files form the basis for the efficient operation of the traffic department of the Panhandle Refining Company of Wichita Falls, Texas, while the department has been developed into a valuable aid to the sales branch of the company in promoting good will and maintaining friendly business relations with customers. The traffic division of the Panhandle Refining Company is under the management of Garth W. Reed, who shares with the sales manager the responsibility of keeping satisfied customers by giving prompt service on deliveriess and handling in a diplomatic manner any controversies arising with customers on car routings.

The contact made by the traffic department of a refinery with customers is almost as great as that maintained by the sales division, and repeat purchase orders are often governed by the co-operation and service rendered by the traffic branch of the manufacturer. New customers having limited knowledge of the importance of avoiding empty mileage accumulation on tank-car returns is one of the difficult problems for the traffic managers, and a certain amount of educational work is necessary by diplomatic letters from the traffic department. This trouble as a rule is not intentional on the part of the costumer, and a stiff reprimand from the traffic manager often creates an unfriendly regard for the company, with the result that repeat orders do not follow. Since the traffic department is duty bound to curtail excess mileage accumulation, it requires no small amount of tact and patience to win a new customer over in following out the instructions given by the traffic manager.

Keeping Mileage

The card forms and accounting system employed by the Panhandle Refining Company in keeping tab on its fleet of tank cars is somewhat similar to that used in general by refineries, and greatly simplifies the work of protecting the company on mileage earnings and against an unexpected car shortage. At certain seasons of the year the entire rolling stock is in demand, and a serious shortage of tank cars during this period of heavy movement of refined products hinges on the efficiency of the traffic department. Improved freight service by all railroads within the past two years has enabled refiners to trim their tank car requirements, and in doing so the traffice department is forced to follow the movement of cars closer than ever to maintain an ample supply of empties at the plant. This change in conditions has materially added to the efficiency of the traffic department, and at the same time reduced the transportation expense.

The Kardex filing cabinet, containing a separate card for each tank car, is used by the Panhandle Refining Company in recording the movement of its cars. These cards are arranged in numerical order according to the number assigned to the car, and are 5x7 inches in size. The number of the tank car is shown at the top of the card, while two lines below have blank spaces to fill in the name of the company, address, date, contents and complete railroad routing that the car is intended for.

Record of P. H. R. X. Car No. 58

Shipped to Panhandle Oil Co. at Grenada, Miss. Date 5-11- 192 5

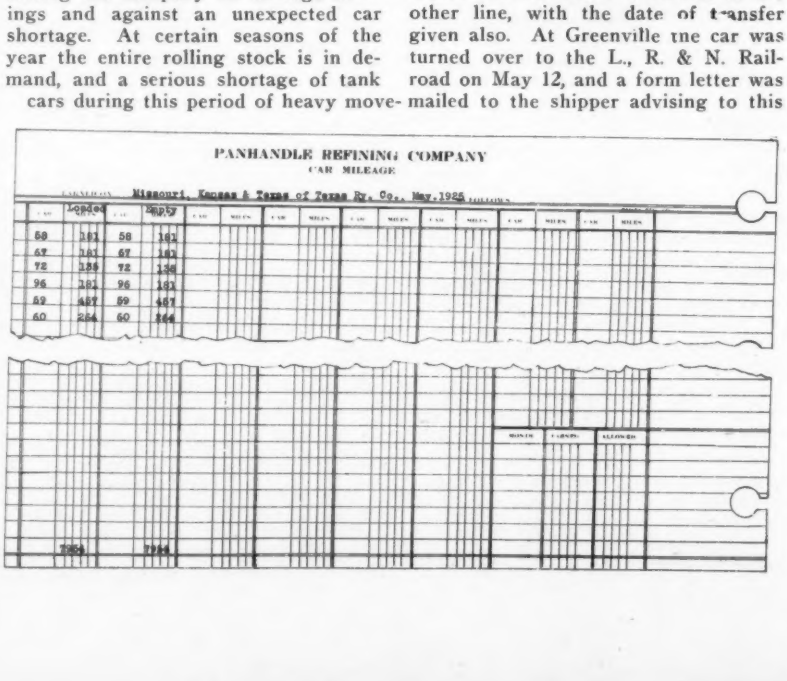
Contents Gasoline Via MK&T-T LR&N-T VS&P A&V Jackson IC

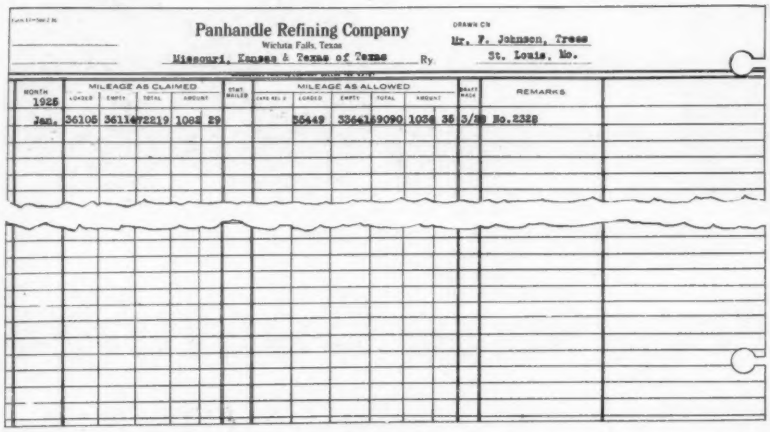
DELIVERED TO				MOVEMENT		MILEAGE	
ROAD	AT	DATE		FROM	TO	LOADED	EMPTY
Katy				Wichita Falls	Greenville	181	
LR&N-T	Greenville	5	12	Greenville	Shreveport	174	
VS&P	Shreveport	5	13	Shreveport	Vicksburg	171	
A&V	Vicksburg	5	14	Vicksburg	Jackson	44	
IC	Jackson	5	14	Jackson	Grenada	111	
IC	Grenada			Grenada	Jackson		111
A&V	Jackson	5	21	Jackson	Vicksburg		44
VS&P	Vicksburg	5	23	Vicksburg	Shreveport		171
LR&N-T	Shreveport	5	24	Shreveport	Greenville		174
Katy	Greenville	5	26	Greenville	Wichita Falls		181
Katy	Wichita Falls	5	28				

CAR NUMBER 58

A Letter Helps

The accompanying illustration, described as Fig. 1, shows the record of a car of gasoline starting from Wichita Falls refinery for Grenada, Miss., in tank car No. 58, via the Katy railroad. The name of the railroad receiving the car is listed in the first column on the card, and the second column carries space for the name of the junction at which the car was transferred to another line, with the date of transfer given also. At Greenville the car was turned over to the L., R. & N. Railroad on May 12, and a form letter was mailed to the shipper advising to this





Panhandle Refining Company
Wichita Falls, Texas
Missouri, Kansas & Texas of Texas Ry.
Mr. F. Johnson, Treas
St. Louis, Mo.

MONTH 1925	MILEAGE AS CLAIMED LOADED	EMPTY	TOTAL	AMOUNT	STAT. MILES	MILEAGE AS ALLOWED CARS NO.	LOADED	EMPTY	TOTAL	AMOUNT	DRAFT PAID	REMARKS
Jan.	36106	36114	72219	1082	89		36449	3366	139090	1036	36	3/30 No. 2328

effect. Upon receipt of this notification the traffic department of the shipper posts this information on the card, and so on for each succeeding railroad until the car reaches its destination.

A column for the loaded and empty mileage built up by the car between each railroad junction is shown on the right-hand side of the card, and this is also posted up to date upon receipt of the report from the carriers. The return movement of the car is registered on the same card, giving dates of arrival at each junction, and empty mileage between points. This return movement is the reverse of the routing of the loaded car, except when the consignee fails to turn over bill of lading to carrier starting the return journey of the car.

The junction reports on car movement enable the shipper to account for the approximate location of each car at all times when kept posted on car record cards, and when a car is lost en route, a tracer is requested of the last carrier credited with having the car. Upon the return of tank car to the refinery from a trip, the card used in reporting on the last journey is kept in the Kardex cabinet, and the car is known to be available for another trip by reason of the last notation on the card, crediting it with being in Wichita Falls. When car is reloaded for another trip, the last card used in following the car movement is replaced by a new card, which shows the name of the consignee, address, routing, etc., while the old card is filed away in the morgue for future reference, if needed.

Checking By Cards

From the car record cards information is obtained as to how much loaded and empty mileage each car earned from various railroads handling the freight consignment, and this is posted by months on loose-leaf forms called "car mileage" sheets, as illustrated by Fig. 2. The account of each railroad is kept separately on these sheets, which are printed alike on both sides in order to conserve space in the binder. The loaded and empty mileage of each car for each railroad is listed separate to afford a quick check when the statement rendered by the carrier disagrees with that of the car owner. The total mileage for the month for all cars handled by each individual railroad is listed at the bottom of the car mileage sheet.

A monthly statement showing a recapitulation of the gross mileage claimed and allowed, and revenue earned, is carried on a separate form in loose-leaf binder form for each railroad, as illustrated in Fig. 3. The sheets are filed in alphabetical order, according to railroads, and for convenience a space is set aside in the upper right-hand corner of the sheet for the name and address of the treasurer, on whom the draft is drawn for payment of the earned mileage. This section of the Panhandle Refining Company's traffic department bookkeeping system is the tell-tale story as to whether its cars are making their maximum earnings, and the amount of the draft, date and number as paid by the railroad is shown in the right-hand columns, with a line left open for remarks. The printed matter is the same on both sides of this sheet.

Natural Gasoline Plant Owners Resume Meetings

Tulsa, Oklahoma.—District meetings of natural gasoline plant operators, under the auspices of the Association of Natural Gasoline Manufacturers, will be resumed in September. While the meetings will be similar to those carried on last summer, programs will differ and the season for the meetings is being changed.

The different programs will come through the advancement in gasoline plant practice and the introduction of new and different equipment. These programs will serve to keep the operators of plants in the Mid-Continent area abreast of both equipment development and plant practice.

The change in seasons was decided on because of the intense heat of the summer months. Last year, the first for holding such sessions, the meetings continued throughout the summer and were a pronounced success, despite the hot weather. Meetings were held in cities from Ponca City to Breckenridge, Texas.

The whole gasoline plant territory of the Mid-Continent territory will be covered again this year. To do this, the meetings will be carried into the winter, as it is calculated the winter months will be more pleasant for gathering men to hear the sessions.

R. R. Owens, superintendent of the natural gasoline department of the Marland Refining Company, Ponca City, Oklahoma, is chairman of the committee on Plant Operators' Meetings. In working out the programs, he will have the assistance of A. V. Bourque, secretary of the association. Secretary Bourque has just returned from Chicago, where he was called on account of the death of his mother. He expects to leave his headquarters August 20 for a vacation and will return to his desk early in September.

With his return, final details of the meetings of plant operators will be worked out. A schedule of the meetings will be announced and this will be followed. By announcing a schedule owners of plants can prepare to have their men attend the sessions.

The Association of Natural Gasoline Manufacturers was the first organization within the petroleum industry to offer an opportunity for the dissemination of technical and practical knowledge within the industry. A session for plant operators at one of the annual conventions in Tulsa proved so popular that the decision to hold the district meetings of plant operators followed. This was followed out last summer with pronounced success.

Since then other associations, particularly the Western Petroleum Refiners' Association and the National Petroleum Association have adopted the plan of devoting a part of their annual convention programs to technical and practical questions for the men engaged in operating their plants.

The gratifying part of the meetings for plant operators was the manner in which the men from the plants attended the sessions. Each meeting became an open forum. Some speaker was designated to discuss a subject, a program having been prepared. At the close of each speech, the meeting was thrown open for free discussion.

This method is to be followed in the series of meetings that will begin in September and continue through the winter months.

Special Terminal Box for Bubble Tower

Tube Still Header with Ohioloy plugs—Alloy closure with strength of steel and 50% greater expansion; non-corrosive.

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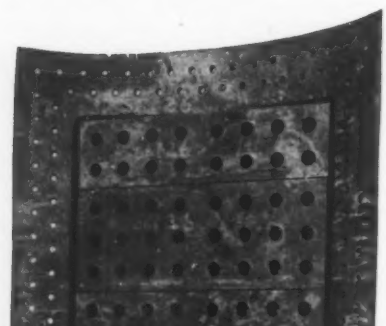
For Oil, Steam and Gas Service



High Pressure Reboiler Frame and Headers

Hi-Steel pressure castings are cast from refined electric steel from which the weakening impurities have been removed.

Carefully planned and supervised molding methods, together with special equipment for drying molds and cores, insure their solidity; improved annealing equipment and scientific methods of heat treatment refine and toughen the steel itself.

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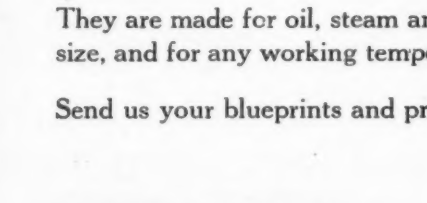
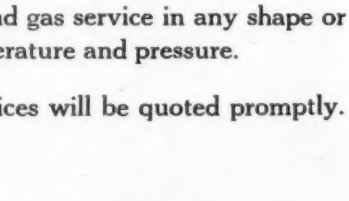


Header Box and Cover used on Condenser



Flanged Saddle Nozzle for Pressure Tank

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Expansion Methods of Refining Described by Its Inventor

During its laboratory stages and later in commercial installation the Collins Expansion method of refining hydrocarbon materials has drawn attention from engineers and scientists.

The description presented here was prepared by the inventor of the method, Russell K. Collins of Fort Worth. Plans are now under way for the construction of other plants to use this method of manufacturing gasoline.

THE expansion process is operated without the dangers and initial material loss and rapid depreciation of equipment owing to the fact that only atmospheric pressures and consequently comparatively low temperatures are maintained. Engineers for large refining companies, both American and foreign, have been unable after exhaustive tests to find any carbon deposits in the Collins refining apparatus. The present plant is the property of the Sunrise Laboratories Corporation of Fort Worth and Ranger, and all test runs are being supervised and checked by chemists of the Terrell Laboratories of Fort Worth.

The expansion process can be used as either a batch, semi-continuous or continuous process of refining operating on crude, topped crude, gas oil or fuel oils, it having been demonstrated during experiments that one or more stills may be run in any of these three ways without disadvantageous effects upon the wax or lubricating residuums due to the fact that the process is an entirely new type of refining by distillation without pressure or high temperatures.

In operating the expansion process of refining hydrocarbon materials the initial material is charged either direct or through a heat exchanger to the shell type horizontal stills, and in the case of crude oil containing a recoverable amount of "straight run" gasoline the first stills are used for skimming as in any refinery, the fourth, fifth and sixth stills being equipped with Collins Expanders.

The vapors from No. 4 still pass into No. 1 expander where they are subjected to a thermo-mechanical treatment that has the effect of rearranging their atomic and molecular structure to produce a larger yield of gasoline, naphtha or kerosene as is desired, the bottoms from No. 4 still flow into No. 5 still and the vapor therefrom is treated in No. 2 expander; the bottoms from No. 5 still flow on to No. 6 still, the vapor from it being treated in No. 3 expander. The adjustment of the ractions in Numbers 1, 2 and 3 expanders being different as the vapor treated by each has a much different compound formula than that of the other two, consequently requiring a different thermo-mechanical adjustment to produce a product comon to all the expanders of the battery.

This product is then treated and steam distilled as in ordinary skimming plant operations. The rate of distillation is much faster than cracking or skimming operations but is easily controlled and the plant is not subject to any dangers or depreciations that are not common to a skimming plant of usual type good construction. It is of course understood that the vapor passes from the expanders of the battery to the usual good type of dephlegmators and condensers now in use in practically all refineries where it is condensed under atmospheric pressure and run into receiving tanks.

The expanders are fired to about 100-150 degrees F. above the distillation temperature required to vaporize the initial liquid oil in the case of gas oil, while lower and higher ratios are used on other types of compounds, 1250 degrees being the maximum temperature ever used even in experimental runs, commercial runs do not of course require any such temperature, and rarely ever go above 900 degrees F.

The rate of vapor flow through expanders on different materials averages about four lineal feet per second and the time of exposure of a vapor particle averages about three seconds. No fixed temperatures, rates of distillation or time of exposure are prescribed for this process of refining as it can be readily seen by anyone familiar with the physical and chemical structure of the hydrocarbon molecules that these factors and their ratios can not be maintained at a fixed point for the production of increased yields of, say gasoline or, naphtha from gas oil, wax distillate and fuel oil but must be varied to meet the requirements of each compound if it is desired to get the maximum yield of gasoline from each compound.

A temperature, flow and time factor that will produce a maximum of conversion of a heavy fuel oil would of course be over done were it used on a heavy kerosene distillate, while the reverse would be the fact were the adjustment used on the kerosene distillate used on the fuel oil. However, continuous changes in adjustments are not necessary further frequent changes in these adjustments would be attended by fluctuation in the per cent yield and quality of the product sought from the refining reactions, as is also the case in ordinary skimming operations when the still fires are rapidly changed by an inexperienced fireman or stillman.

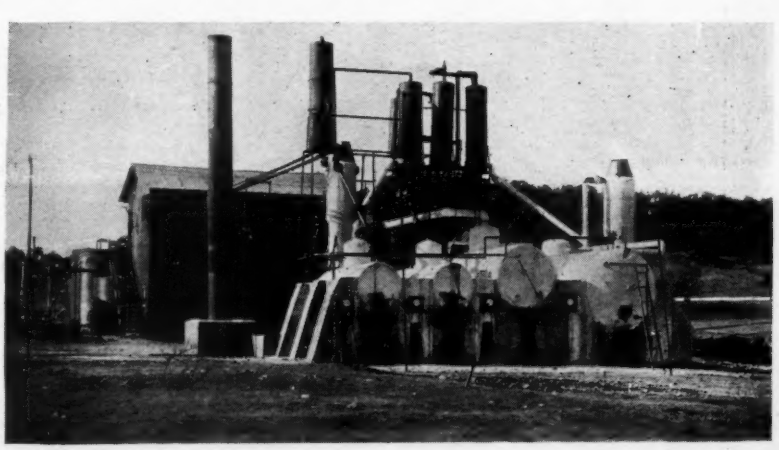
Tulsa Office Opened

The Standard Tank Car Company of Sharon, Pennsylvania, has transferred its St. Louis office to Tulsa. Headquarters are at 416 Atlas Life building and Frank S. Thompson is in charge.

California Gasoline Consumption

Sacramento, Calif.—Consumption of gasoline in California during the quarter ending July 1 showed a gain of 13 per cent over that of the preceding quarter, according to a tax receipt statement given out by the state board of equalization July 30.

Tax receipts from the 203,279,495 gallons of gasoline sold during the quarter ending July 1 amounted to $4,065,589.91, a gain of $588,156.01 over the preceding quarter's receipts.

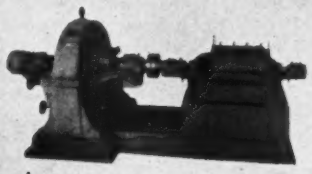


Plant of the Sunrise Laboratories Corp., where the Collins Expansion method of refining is in use

For Reliable Pump Drive

For driving large slow speed pumps Terry geared units are ideal.

Terry vertical turbines cover a wide range of sizes, suitable for driving deep well pumps.



A single stage Terry is the simplest type of prime mover - it has a single one-piece wheel.

The extreme simplicity of Terry construction insures continuity of service.

Terry turbine driven pumps are easily adapted to automatic regulation.

Single stage Terrys operate with high efficiency at low speed.

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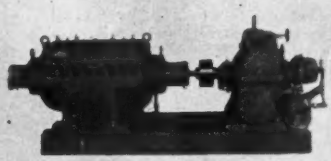

A Terry drive avoids providing against detrimental overload - it is impossible to overload a Terry.

A complete line of Terry multi-stage turbines are available for condensing operation.

Terry turbines are free from all external disturbances except boiler failure.

Any type of centrifugal or rotary pump may be efficiently operated by a Terry turbine.

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Fire Wall Construction for Oil Storage Tanks

By H. H. Hall[1]
M. Am. Soc. C. E.

DURING 1924 larger quantities of petroleum and petroleum products have been in storage in the United States than ever before. Considering the amount of this oil in storage and its generally inflammable nature, the fire loss has been remarkably low.

Refined oils (which comprise by far the largest part of oil storage in or near cities and towns), when ignited simply burn quietly until they are extinguished or burned dry; but crude petroleums, and occasionally refined fuel oils, are liable to boil over while burning. In order to make the storage of these latter products as safe as that of the refined oils, it is necessary to surround the container with so-called fire-walls.

The service to be rendered by these structures is a peculiar one from an hydraulic standpoint, as their primary function is to withstand the single wave of oil thrown out by the "boil-over". In an effort to find the best possible design, the series of model tests here described was conducted, the outstanding result being a demonstration of the value of some form of flash-board or coping which will curl the advancing wave back on itself.

Introduction

The discovery of a number of extremely prolific petroleum pools in both Oklahoma and California during 1922 and 1923 has resulted, in spite of a rapidly growing market, in a considerable over-production of all forms of petroleum products. In round figures, oil in storage has increased since 1921 from 200,000,000 barrels to more than 500,000,000 barrels. This phenomenal growth has fixed the attention of many petroleum engineers on the design and proper protection of oil storage, with the result tnat a number of advantageous changes have been made. One of the most obvious changes, brought about by this study, has been a mineral increase in the size of storage units—both of the reservoir and the steel-tank type. Concrete-lined reservoirs have been built to contain more than 3,000,000 barrels (42 gal. each); and steel tanks holding 150,000 barrels per unit are not uncommon.

Among the changes looking toward better protection of the storage there has been a considerable extension in the use of fire-proof and vapor-proof roofs, and the addition of numerous devices which are intended primarily to prevent evaporation loss, but which incidentally improve fire protection by lessening or eliminating the escape of inflammable vapors.

Although in such carefully protected storage fires are a rather rare occurrence (particularly in California where the danger from lightning is small) the study of methods for guarding against the spread of fire has not escaped some scrutiny in connection with this general study of oil storage. Unfortunately, some of these products have a disconcerting habit of boiling over after burning for varying lengths of time. Recent studies have shown that these boil-overs are confined to crude, and, in some cases, to fuel oils. In order to prevent the possible spread of burning oil from structures containing either of these products, it is necessary to surround them with a fire-bank or wall of such dimensions that it will not be topped by the sudden wave-like advance of the oil which has boiled out. Aside from this requirement, the fire-walls need not, in general, be able to withstand much static pressure. The boil-overs, while sudden and violent, do not as a rule discharge any large part of a tank's contents; and although occasional tank leaks occur, the complete collapse of a full tank is so rare as to justify the designer in almost neglecting this possibility. The fire-wall problem is, therefore, primarily a question of stopping a single wave of high velocity.

Lack of knowledge as to which oils are likely to boil over, as well as lack of attention to this principal requirement of fire-wall design, has had two unfortunate results. Occasionally earth fire-walls have been built so low as to be topped by burning oil; and frequently city authorities and fire protection engineers, in the absence of exact knowledge as to what emergency to expect and how to meet it, have insisted on excessive clearance distances and fire-wall requirements around oil storage. With a view to clearing up the general question of fire-wall design both of the permanent and temporary types, Standard Oil Company of California decided to undertake a series of model tests. Ultimately, these included more than 1000 minia- which the "spills" occurred could be varied, corresponding to different heights of tanks and refinery receiving "pans."

Model fire-walls were constructed, to the same scale, and placed at various locations in the trough. As shown in Fig. 1, the wall is at a distance corresponding to 100 feet from the tank, this being common practice for walls surrounding tanks on comparatively level ground. A majority of the tests were made with the walls in this position; but data were also obtained for locations (to scale) 50 feet and 20 feet from the tank. Model walls of the following shapes were tested:

1.—Earth walls with a 1 on 1.5 side slope;

2.—Earth walls with a 1 on 1 side slope (Fig. 3, right ;

3.—Vertical walls (Fig. 4, right ; and

4.—Modifications of the foregoing, using copings of various sizes and shapes (see Figs. 3 and 4).

Procedure and Results

1.—Preliminary Tests—Some preliminary experimenting was first done to determine (1) the way in which the gate releasing the water must be jerked open in order to obtain uniform results; (2) the criterion which should be used in judging the performance of different wall shapes; and (3) the effect of varying the height of the box from which the spill was discharged (Dimension A. Fig. 1). These tests are described in detail in the Appendix.

ture boil-overs (using water for most of the tests) directed against 66 differently shaped walls and other obstructions.

Apparatus

The principal item of apparatus used was a wooden trough representing, at a scale of 1 to 14, a segment extending radially from the center of a tank 115 feet in diameter (see Figs. 1 and 2). At the tank end of this trough was placed a box from which the boil-overs could be discharged by jerking open a gate; the area of this box was made considerably larger relatively than that of a segment of the tank, with the thought that when a boil-over occurs, the frothing oil coming out of the tank is generally driven by the wind, so that most of it is concentrated on one side of the tank. The box was made adjustable so that the height from

2.—Comparison of Standard Shapes. —The first main series of tests was

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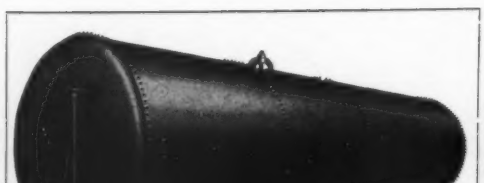
[1]Chief Engineer Standard Oil Co., (California), San Francisco, Calif.

Note—Published in May 1925, Proceedings of the American Society of Civil Engineers, under the title, "Fire-Banks for Oil Storage", pp 721 to 747, and presented at the meeting of the Society in New York, June 3.

[2]The energy represented by the elevation of the bottom of the weir box above the floor board is not considered available, since it appears as vertical velocity and is largely dissi-

Titusville Steel Storage Tanks



Made of the best open hearth homogeneous steel, carefully riveted, caulked, tested and painted before shipment. These tanks are well made, by skilled workmen in a modern shop where only the highest quality of materials are used.

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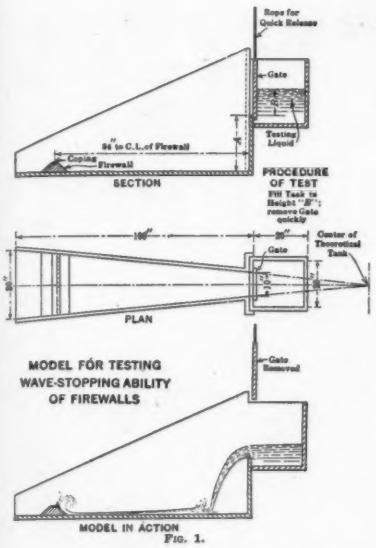

FIG. 1.

run to compare the effectiveness of four of the most common shapes of wall now in use. The results are summarized by Curves 1 to 5, Fig. 5.

It will be noted that the curves for both shapes of earth wall, and for the plain vertical wall, are grouped close together, and have the same general shape and steep slope. Neither of these results is surprising, since all three shapes of wall depend primarily on height alone to stop the rush of water. This height, in turn, must depend approximately on the total energy of the oncoming stream, for the impact of the entire mass of water acts to push the topmost drops to a maximum height, with little loss in turbulence up to the time the spill takes place. As this total energy is approximately proportional to the square of the weir height, W^2, it might be anticipated that the necessary height of wall, H, would vary approximately with the square of W. As a matter of fact, Curve 1 can be closely represented by the equation $H=0.5\ W^{2\cdot 13}$.

In the case of the coped walls the situation is entirely different. Here, the principal part of the energy is expended in turbulence and shock when the coping turns the wave back on itself. The wall can be topped only when the energy of the oncoming stream is so great that all of it can not be dissipated, and the remainder is sufficient to lift some of the water over the wall. Under these circumstances, as indicated by Curve 5, the height of the wall needs to be increased only approximately in direct proportion to the height of the weir. This result indicates the efficacy of the coping as an energy absorber increases with the height of the wall and the violence of the wave—at least, over the range of heights covered by these tests.

Observation of the performance of the model coped walls during these tests showed that the effect of the coping is to turn all of the primary wave back inside the wall; in almost no case did any appreciable quantity pass over a coped wall in the first rush. The water turned back by the coping eventually piles up on that approaching from the tank until, after the velocity of approach is spent, there is for the instant a head causing flow over the wall. In any actual tank field a wave of oil would be free to spread out sideways, and it is probable that the secondary wave which tops the wall could not form so easily as in the experimental model where the water is closely constrained by the side walls.

The results indicated by these curves of Fig. 5 may be compared from two points of view.

(a) With a boil-over of given intensity, what height of each shape of wall is necessary to retain it completely? The answer is obtained by reading from the curves of Fig. 5 the heights of different walls that will stop a given "height of weir", for instance, 3½ in. A graphic comparison of the results is shown in the top row of Fig. 6. On account of the steepness of the slope of Curves 1, 2, and 3 of Fig. 5, a very considerable difference in height is observed between the walls of different shapes necessary to stop this 3½-in. discharge. Furthermore, it may be noted that a coped wall of less than half the height of the straight wall will be equally effective.

(b) With walls of the same height, what magnitude of boil-over will be stopped by different shapes? The middle row of Fig. 6 gives this comparison graphically for walls 5 in. high. When judged by this criterion, there is comparatively little difference between the effectiveness of the sloped walls and of the plain vertical walls; whereas the coped vertical wall is almost three times as effective as any other.

The outstanding feature of these two comparisons is the effectiveness of the coped wall. This is further emphasized by the detailed curves for the different walls shown in the Appendix (Figs. 17 and 18). It will be noted that the curves for walls with sloping sides (Fig. 17) ascend rather steeply, whereas the curve for the straight and coped walls (Fig. 18) are relatively flat. Considering, for example, the case of a 10-inch spill discharged against walls 5 inches high, it will be noted that 40 per cent of this spill passed over the 1 on 1.5 wall (Fig. 17) while under like conditions less than one-half of 1 per cent passed over the vertical wall fitted with a coping (Fig .18). Thus, while the actual "dry-points" plotted on Fig. 5 are probably the most conservative criterion on which to judge the different shapes, it appears that a wall which permits not more than 1 per cent of spill striking it to pass over may be regarded as satisfactory under most conditions. The curves on Fig. 19 have been plotted to compare the different shapes on this basis. It will be noted that the coped walls make an even more favorable showing in comparison with the walls having sloping sides.

3.—Methods of Reinforcing Standard Walls.

(a) Extension on Top of Wall.—A method that has been used to some extent for increasing the effectiveness of earth walls has been to place on top of them a vertical extension consisting of scrap steel plates. The models of walls with a 1 on 1.5 slope were equipped with such extensions 4 in. high (representing an actual height of about 5 ft., see model at left in Fig. 3). The results are plotted as Curve 6 of Fig. 5. It will be noted that this extension resulted in comparatively little increase in the effectiveness of the wall, judged on the basis of complete stoppage of the wave. However, in testing this model it was found that the extension markedly reduced the percentage of the larger spills that passed over the wall.

Observation of the behavior of this coped wall indicated that it would be desirable to tip the extension in toward the tank instead of leaving it vertical. This was accordingly done, with the

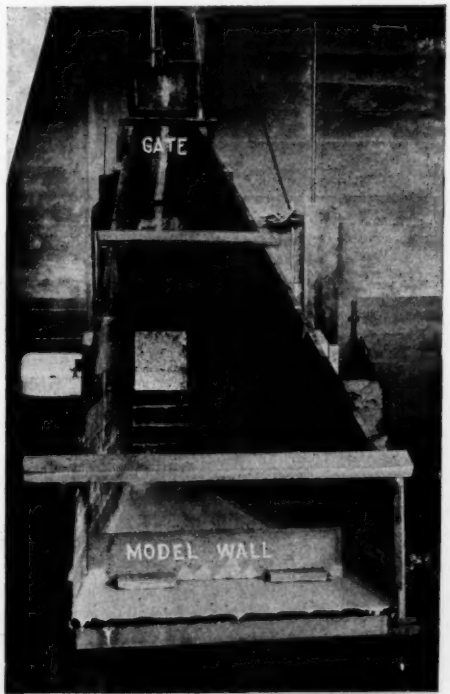

Figure 2.—Front view of test apparatus, showing model coped wall in place. The wall was considered to have stopped the wave when not enough water came over to cause any to run off the "tail board."

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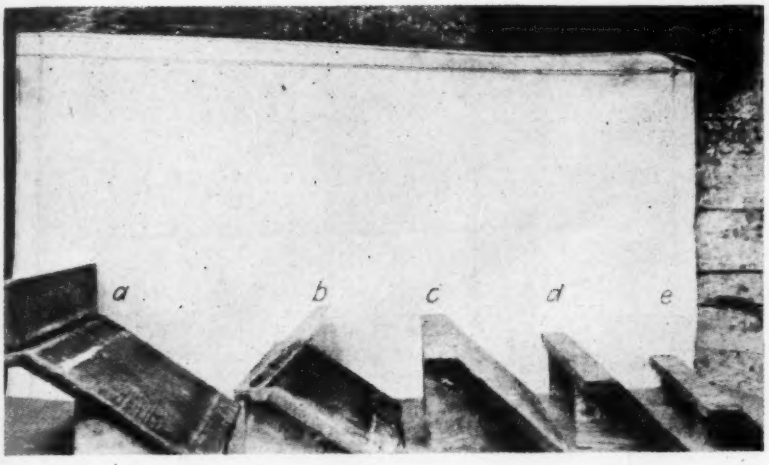


Figure 3

results shown on Curve 8, Fig. 5. It will be noted that this greatly increased the effectiveness of the wall. (See also Figs. 7 and 8). Tests were run using extensions sloped at both 30 degrees and 45 degrees from the vertical. No appreciable difference in the results could be observed. As the 30-degree slope would probably be more convenient in actual practice, it is to be recommended.

This 4-inch "coping" proved so effective it was felt that an extension of half the height (still tilted back toward the tank) would give satisfactory results. This was tried, with the results shown by Curve 7 of Fig. 5.

It will be noted that even this small reinforcement materially increased the effectiveness of the wall, particularly at lower heights. The shape of this curve, indicating as it does that high walls will not stop such large boil-overs as low ones, is peculiar; but it has been carefully checked and found to be correct. The explanation seems to be that, with such a small coping, the long slope of the higher walls gives the force of the wave such a strong component in an upward direction that the coping is less able to break it up than when placed on a lower wall with a shorter approach.

In discussing the practical application of these "copings," it was suggested that if they were sloped back toward the tank at an agle of 45 degrees, or even 30 degrees, there might be danger that burning oil discharged against the base of the firewall in a preliminary "slop-over" would so warp the sheets that they would not be in shape to function at the time of the main boil-over. Tests were accordingly run using the shape numbered "9" on Fig. 5, in which the coping was placed in an almost vertical position, with a short lip at the top turned back at a somewhat sharper angle. Only one height of this shape was tried, as shown by a single point on Fig. 5, but it will be noted that this point is well to the right of the others, indicating that this shape was the most effective of those tested. (See also Figs. 9, 10, and 11; the "wings" shown in Fig. 11 were used in testing the other coped walls, as it was felt that the corner effect observed in these models would not obtain in practice and tended to obscure the real effectiveness of the different walls). From the results obtained in the detailed Sketch No. 9, Fig. 5, would completely turn back the wave from the most severe boil-over likely to occur in practice, provided the wall is 50 ft. or more from the tank.

It was next suggested that for reinforcing division walls between two tanks, a vertical coping with a horizontal lip on top, as shown in Sketch No. 10, Fig. 5, would be desirable. Tests were accordingly made on a model of this shape, using four different widths of lip. The result obtained with a ½-in. lip (corresponding, for the scale of model used, to a 7-in. extension on an actual coping) is plotted as the single point marked "10" on Fig. 5. It will be noted that this shape also proved very effective, so that a division wall of this shape with a 1-ft. plate at the top of the coping (giving a 6-in. lip on each side) can be counted on to turn back any boil-over, if the wall is at least 75 ft. from the tanks protected. Where conditions require that the wall lie closer to the tank, a wider lip would be desirable—perhaps with a maximum projection of 1 ft. on each side if the wall is within 40 or 50 ft.

(b) Auxiliary Walls Close to Tank.—A study of the behavior of the waves created in those different tests suggested that by breaking the force of the wave just as it struck the ground, the effectiveness of the firewalls would be increased. Tests were accordingly made, first, with a small vertical wall placed 30 in. from the spill-box (corresponding in actual size to a vertical wall a little more than 2 ft. high, approximately 35 ft. from the tank shell.) The results are shown in Curve 11, Fig. 5.

It will be noted that this small auxiliary wall had an important influence in increasing the effectiveness of the different types. Comparing Curves 11 and 7 (Fig. 5), it will be noted that in the case of the higher walls the same 2-in. strip used as a vertical wall near the tank was almost twice as effective as when placed as a coping on top of the wall. Since the auxiliary wall 35 ft. from the tank would be only about 60 per cent as long as that 100 ft. away, the considerably smaller quantity of material needed for the closer wall is a further argument in its favor.

When 4-in. strips were used (corresponding approximately to a 5-ft. steel plate), this superiority of the closer wall was not so marked as far as stopping the wave was concerned (compare Curve 8 with Curves 13 and 15), but, of course, its advantage in requiring less material still remains.

Placing the auxiliary wall close to the tank either in a vertical position or inclined back toward the tank, seemed to make comparatively little difference. Curve 12 applies to a 3-in. vertical wall, and Curve 14 to the same wall inclined at 45 degrees. Curves 13 and 15 give a corresponding comparison between 4-in. walls.

Curve 16 (Fig. 5) brings out the fact that the auxiliary wall close to the tank is just as much of a help to vertical

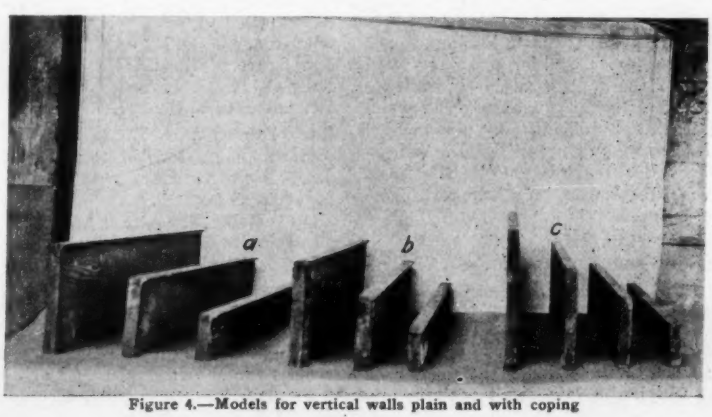
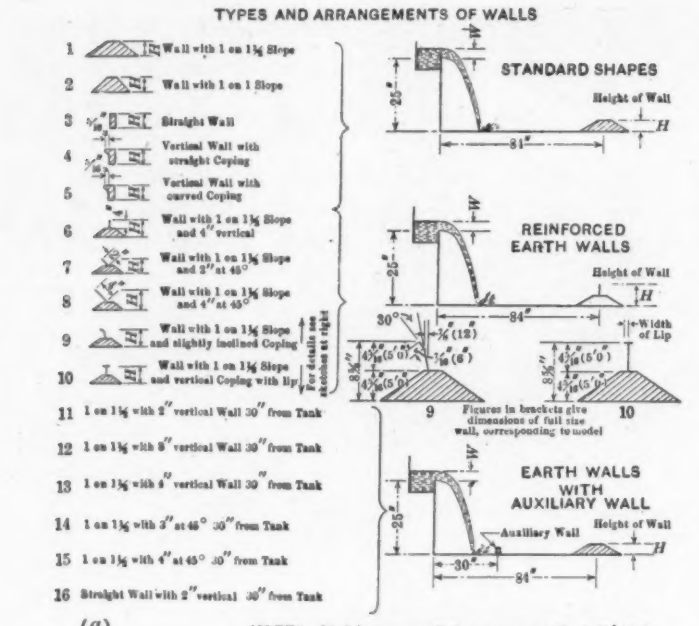


Figure 4.—Models for vertical walls plain and with coping


TYPES AND ARRANGEMENTS OF WALLS
1 Wall with 1 on 1½ Slope
2 Wall with 1 on 1 Slope
3 Straight Wall
4 Vertical Wall with straight Coping
5 Vertical Wall with curved Coping
6 Wall with 1 on 1½ Slope and 4" vertical
7 Wall with 1 on 1½ Slope and 2" at 45°
8 Wall with 1 on 1½ Slope and 4" at 45°
9 Wall with 1 on 1½ Slope and slightly inclined Coping
10 Wall with 1 on 1½ Slope and vertical Coping with lip
For details see sketches at right
11 1 on 1½ with 2" vertical Wall 30" from Tank
12 1 on 1½ with 3" vertical Wall 30" from Tank
13 1 on 1½ with 4" vertical Wall 30" from Tank
14 1 on 1½ with 3" at 45° 30" from Tank
15 1 on 1½ with 4" at 45° 30" from Tank
16 Straight Wall with 2" vertical 30" from Tank
STANDARD SHAPES
Height of Wall
REINFORCED EARTH WALLS
Width of Lip
Figures in brackets give dimensions of full size wall, corresponding to model
EARTH WALLS WITH AUXILIARY WALL
Auxiliary Wall
(a)
NOTE: Models were made to represent a Tank 20′ high with C.L. of firewall 100′ from the shell. Actual Scale used was 1:14; so that roughly 1″=1′+

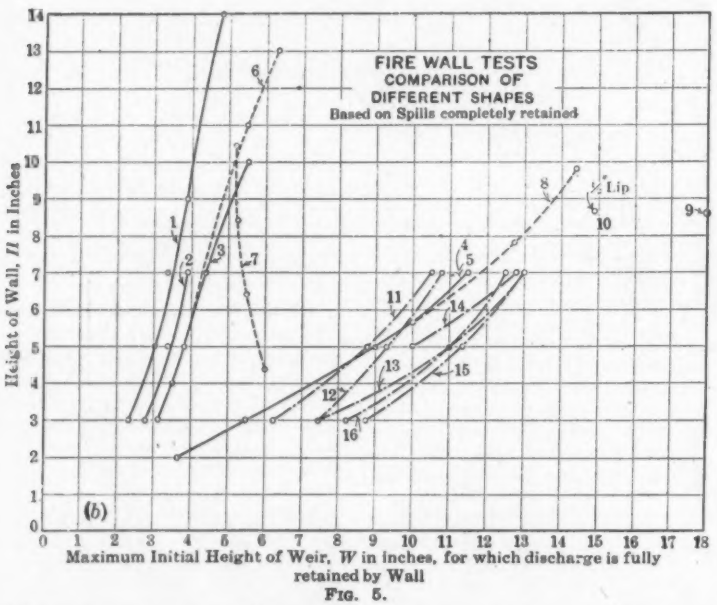

FIRE WALL TESTS
COMPARISON OF
DIFFERENT SHAPES
Based on Spills completely retained
Height of Wall, H in Inches
½" Lip
(b)
Maximum Initial Height of Weir, W in inches, for which discharge is fully retained by Wall

FIG. 5.

firewalls as it is to those inclined to a 1 or 1.5 slope. A 2-in. auxiliary wall close to the tank resulted in moving Curve 3 (for the plain straight wall) out to the position of Curve 16, which shift strikingly emphasized the effectiveness of breaking the force of the wave by having an auxiliary wall close to the tank.

The bottom row of Fig. 6 gives a graphical comparison of the effectiveness of the different types of reinforcement discussed. As indicated, the main firewall in each of these tests was a 5-in., 1 on 1.5 wall. Comparison of the sizes of the spills mentioned, with that which the same wall without any reinforcement will stop (shown as the first figure of the middle row) emphasizes the value of some type of reinforcement to ordinary 1 on 1.5 walls.

(c) Borrow-Pits, Etc., Close to Tank —It was next decided to see whether a pit dug around the base of the tank in such a way that the falling wave would strike the ground surface approximately normally (with the idea of creating maximum turbulence), would produce an effect similar to that of the vertical auxiliary walls. The floor of the model trough was modified to provide such a pit 3 inches deep; the results are shown as Curve 3 of Fig 12. The plain 1 on 1.5 wall is also plotted for comparison. It is evident that the value of the plain wall has been only slightly increased by this arrangement.

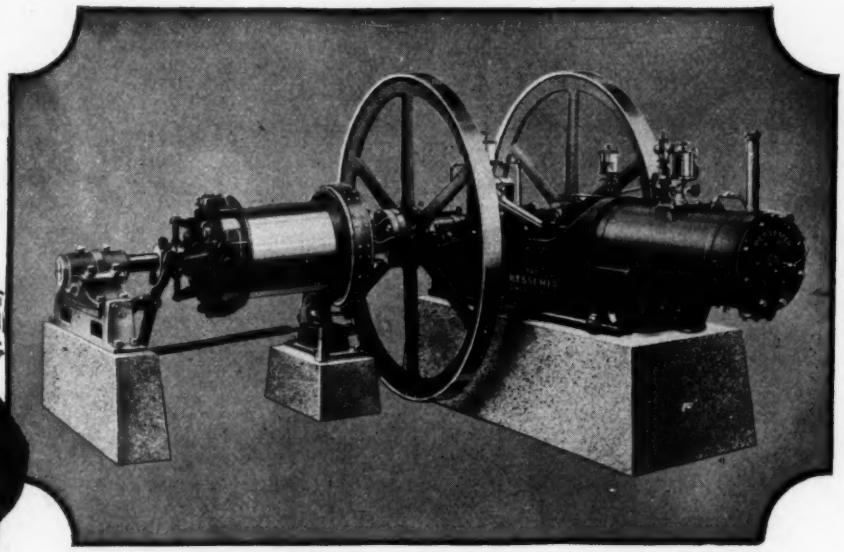
It was then suggested that a low earth wall built just outside the pit might increase its effectiveness. Curve 4 of Fig. 12 (which coincides with Curve 3) gives the results for a pit 2 in. deep with a 2-in. wall on the outside. This indicates that the wall on the outside makes a 2-in. pit as effective as a 3-in. pit without the wall; and, as this would be the logical shape in which to place the dirt, it is recommended. The slope toward the tank should be made as steep as soil conditions permit.

(d) Borrow-Pit at Wall.—During the progress of the tests interest was expressed regarding the possible effectiveness of a borrow-pit on the tank side of an earth wall. The floor of the model trough was accordingly modified with results as indicated by Curves 1 and 2, Fig. 12. It will be noted that the pit next to the wall proved somewhat more effective than the one near the tank already described in Section (c) (compare Curve 1 with Curve 3), and considerably increased the effectiveness of a small coping at the top of the wall (compare Curve 2 with the dotted curve for "1 on 1.5 wall with 2. in. at 45 degrees"). This is a further argument in favor of using a coping on top of 1 on 1.5 walls; for there is generally a borrow-pit on the tank side of such walls.

(e) Rough Surface Between Tank and Wall.—In actual practice the space between the firewalls and tank is sometimes cleared of weeds with a road scraper, which leaves the surface quite smooth; in other cases, the weeds are simply plowed under, leaving a rough surface.

With a view to determining the influence of such a rough surface on a boil-over wave, a strip of tarred paper was laid on the bottom of the model trough, into which was bedded gravel approximately ¼ in. in diameter and less. To scale, these bits of gravel simulated clods about 4 in. high. The results of the tests with this equipment are shown as Curve 5 on Fig. 12. It will be noted that the gravel had a marked effect in breaking up the force of the wave, and this enabled a wall of given height to stop a much greatder spill than it could if the intervening space were smooth (compare Curve 5 with the dotted curve "Plain 1 on 1.5 Wall").

(f) Toe Cut-Off 1 on 1.5 Walls—In cleaning up around certain firewalls, it has been the practice to cut off the toe of the wall, on the tank side, leaving a vertical face about 1 ft. high at the base. Tests were requested to determine the influence of this change on the effectiveness of the wall. Curve 6



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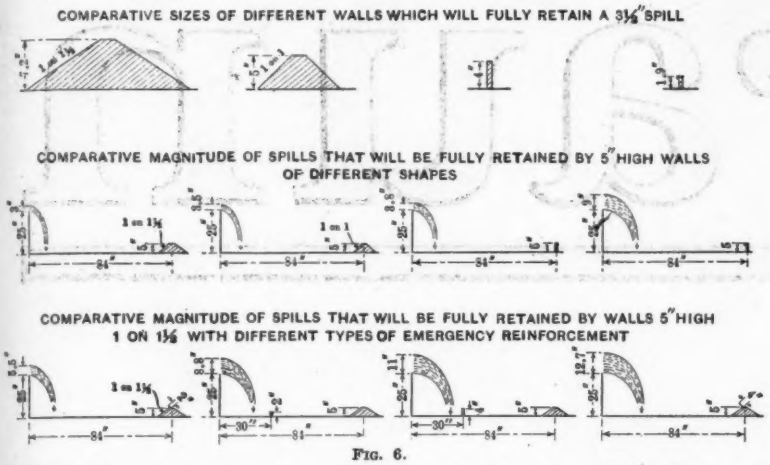
COMPARATIVE SIZES OF DIFFERENT WALLS WHICH WILL FULLY RETAIN A 3½" SPILL
COMPARATIVE MAGNITUDE OF SPILLS THAT WILL BE FULLY RETAINED BY 5" HIGH WALLS OF DIFFERENT SHAPES
COMPARATIVE MAGNITUDE OF SPILLS THAT WILL BE FULLY RETAINED BY WALLS 5" HIGH 1 ON 1½ WITH DIFFERENT TYPES OF EMERGENCY REINFORCEMENT

FIG. 6.

of Fig. 12 shows that, as in the case of borrow-pits, this expedient, while it does move the curve in the right direction, adds only slightly to the effectiveness of the plain wall.

(4)—Effect of Placing Walls Close to Tank.

(a) Wall 50 ft. from Tank.—The model walls were next set in a position corresponding to a distance of 50 ft. from the tank shell. The results are summarized by the curves on Fig. 13. It will be noted that the different shapes showed, in general, the same relative behavior as in the previous tests.

At this closer distance the effectiveness of the vertical wall, as compared with the 1 on 1.5 wall, was relatively greater than at the 100-ft. spacing. On the other hand, the coping on top of the vertical wall did not result in such a marked increase in its effectiveness as had been previously observed. This led to the suggestion that a heavier coping might be desirable; a comparison of Curves 3 and 4 of Fig. 13 indicates that doubling the width of the coping increased the effectiveness of the wall by about 20 per cent. The coping on top of the 1 on 1.5 wall showed the same marked effectiveness as in the previous tests (Curve 5 of Fig 13).

b) Wall 20 ft. from Tank.—When the model walls were moved in to a distance (17 in.) corresponding to 20 ft. from the tank shell, the differences in the behavior of the various shapes were not so marked. The curves on the upper half of Fig 14 show the results when the boil-overs were discharged from the 25-in. height used in previous tests (corresponding to a 30-ft. tank); and the data on the lower half summarize the results of a few tests in which boil-overs were discharged against low walls from a height of 8½ in., corresponding to the 10-ft. "receiving pans" commonly used in refineries.

It is felt that the small differences indicated by these tests (Test 4 (b)) are attributable mainly to the fact that when the model walls were moved close to the tank, there was hardly room for wave action to occur. In practice, of course, these conditions would not hold. It seems likely that the advantages of copings observed in those previous tests where the wall was far enough away from the tank for wave action to develop, would make themselves felt to practically the same extent where actual walls are within 20 ft. of the tank.

5.—Reservoir Fire Walls.—In connection with some contemplated strengthening of reservoir fire-banks, tests were requested to determine the influence of a small mound and borrow-pit at the toe of a reservoir slope.

As was the case with the vertical auxiliary walls near the tank, described under Test 4(b), the mound at the base of the slope served to break the force of the wave to such an extent as to enable a given height of main wall to stop a much larger wave; or, conversely, with a given intensity of boil-over to stop, the main wall can be made considerably lower if the auxiliary mound is built at the top of the slope.

Since a relatively small quantity of earth is required to build this mound (both on account of its low height and small radius as compared with the main fire-wall), the total yardage of earth required to obtain a given degree of protection is 20 or 30 per cent less when the mound is used than when the main wall is built high enough to stop the wave without any auxiliary protection.

6.—Tests With Foam Solutions.—In

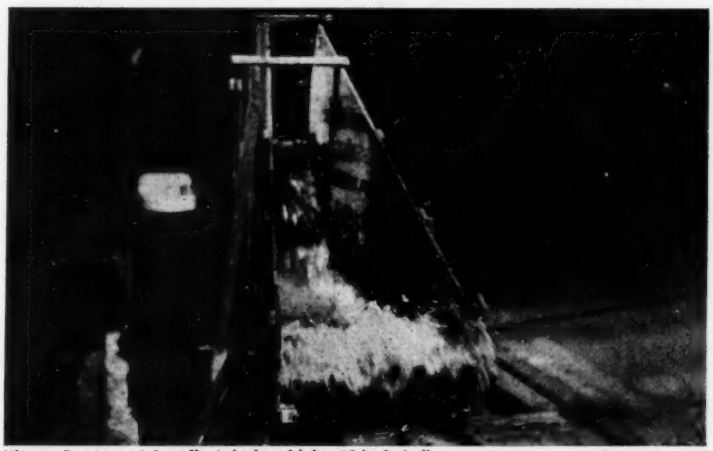

Figure 7.—1 on 1.5 wall, 3 inches high; 12-inch boil-over 45 percent passing over wall

[4]Basic and acid liquids used to produce foam for extinguishing oil fires, see U. S. Bureau of Mines, Bulletin No. 170, p. 10.

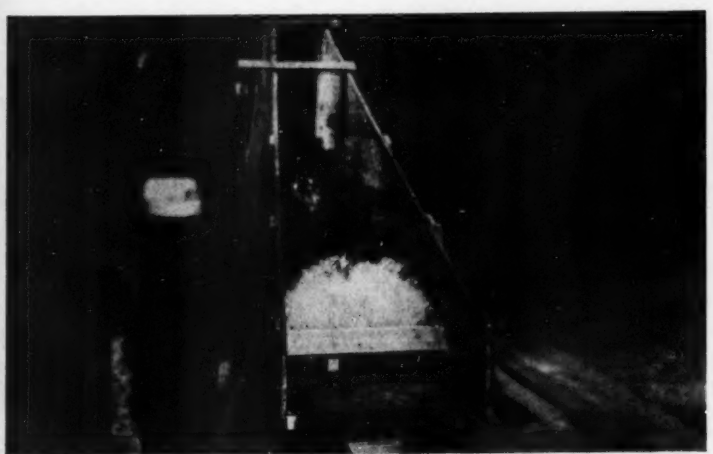

Figure 8.—Same wall as in figure 7 with addition of 4-inch coping sloped at 45 degrees toward tank; 12-inch boil-over stopped.

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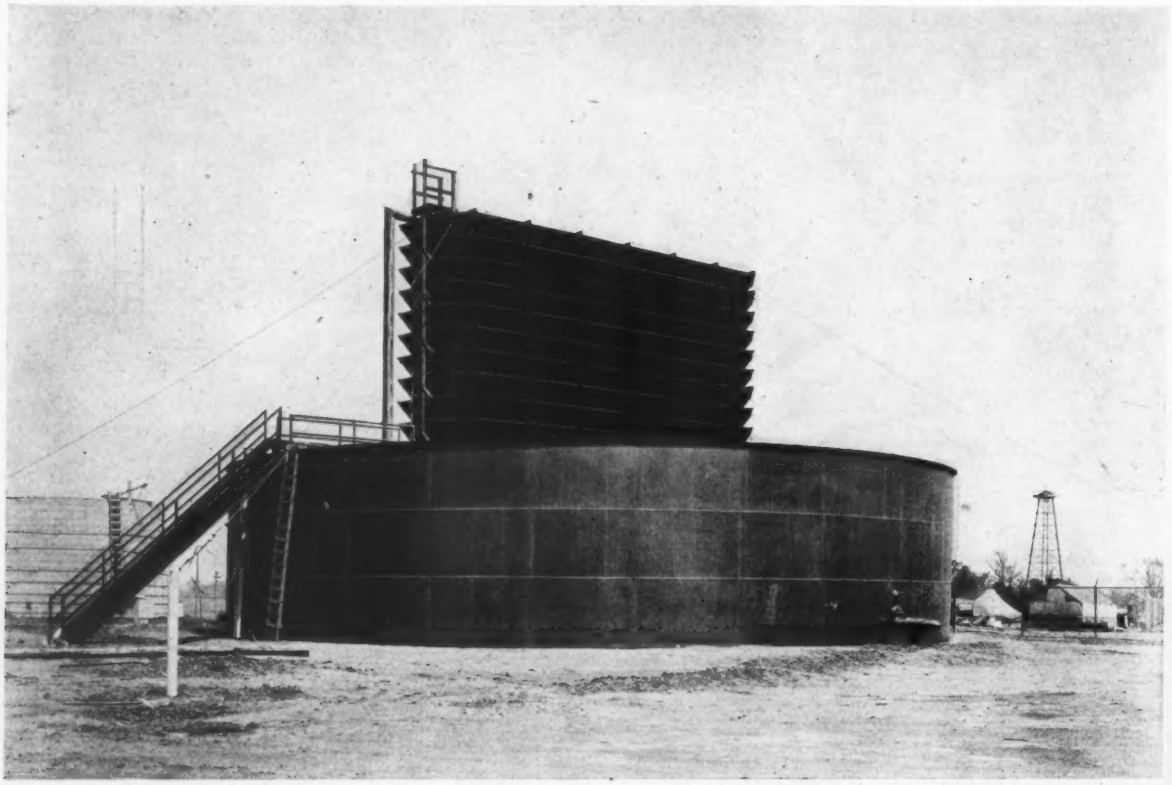

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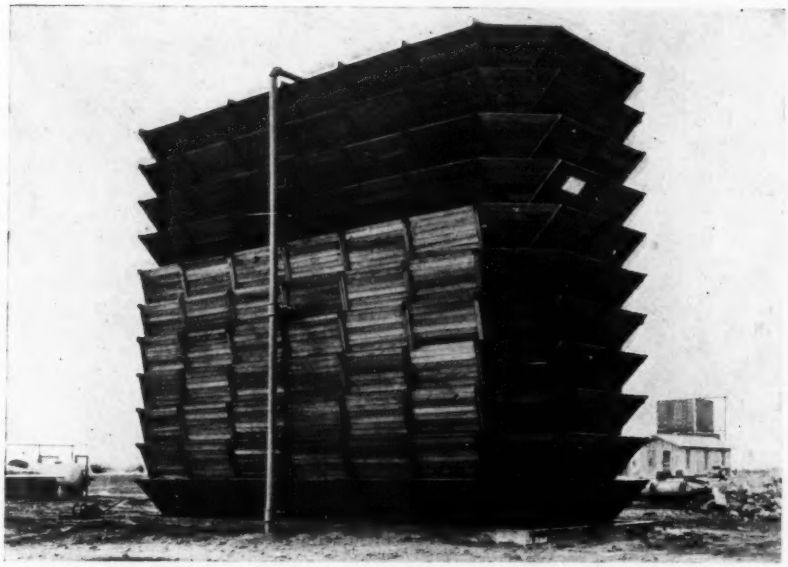

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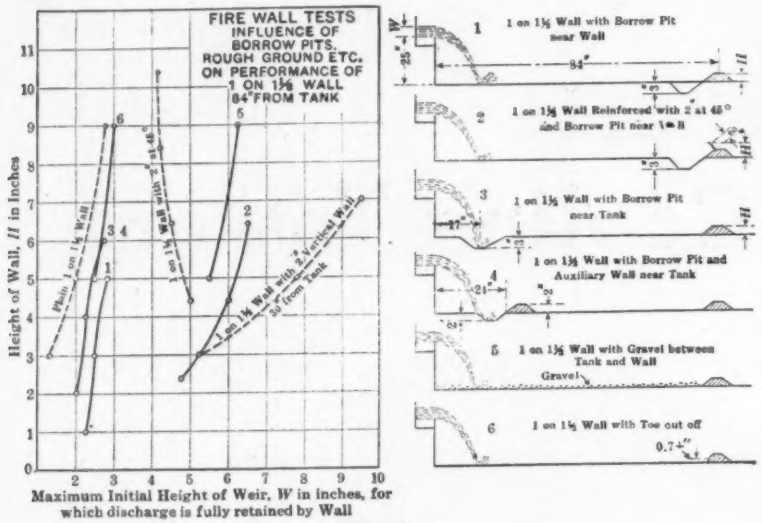
FIRE WALL TESTS
INFLUENCE OF BORROW PITS, ROUGH GROUND ETC. ON PERFORMANCE OF 1 ON 1½ WALL 84" FROM TANK
Height of Wall, H in Inches
Maximum Initial Height of Weir, W in inches, for which discharge is fully retained by Wall
1 on 1½ Wall with Borrow Pit near Wall
1 on 1½ Wall Reinforced with 2" at 45° and Borrow Pit near Wall
1 on 1½ Wall with Borrow Pit near Tank
1 on 1½ Wall with Borrow Pit and Auxiliary Wall near Tank
1 on 1½ Wall with Gravel between Tank and Wall
1 on 1½ Wall with Toe cut off

FIG. 12.

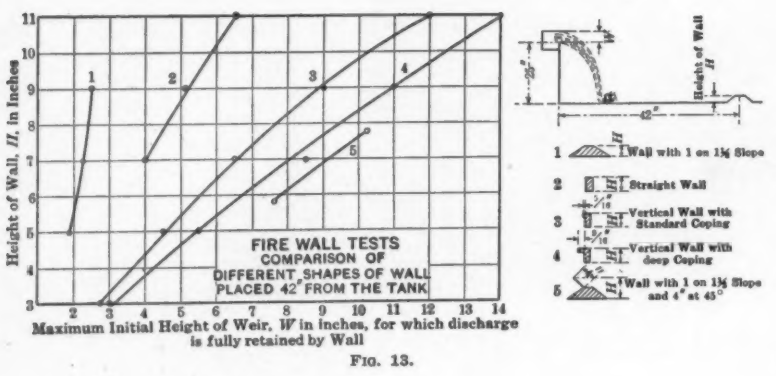
FIRE WALL TESTS
COMPARISON OF DIFFERENT SHAPES OF WALL PLACED 42" FROM THE TANK
Height of Wall, H, in Inches
Maximum Initial Height of Weir, W in inches, for which discharge is fully retained by Wall
Wall with 1 on 1½ Slope
Straight Wall
Vertical Wall with Standard Coping
Vertical Wall with deep Coping
Wall with 1 on 1½ Slope and 4" at 45°

FIG. 13.

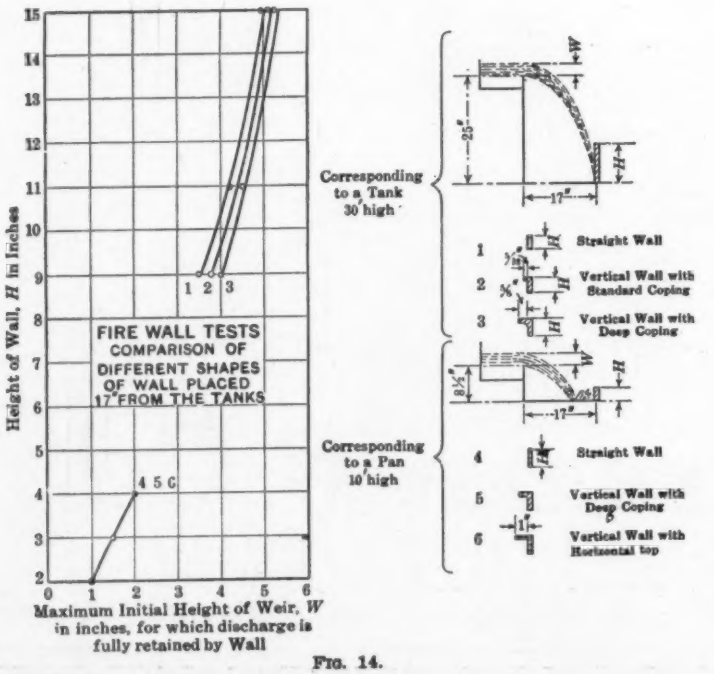
FIRE WALL TESTS
COMPARISON OF DIFFERENT SHAPES OF WALL PLACED 17" FROM THE TANKS
Height of Wall, H in Inches
Maximum Initial Height of Weir, W in inches, for which discharge is fully retained by Wall
Corresponding to a Tank 30' high
Corresponding to a Pan 10' high
Straight Wall
Vertical Wall with Standard Coping
Vertical Wall with Deep Coping
Straight Wall
Vertical Wall with Deep Coping
Vertical Wall with Horizontal top

FIG. 14.

the tests previously described, water was used on account of its convenience. However, in discussing some of the results, it was suggested that it would be interesting to use a liquid that froths and expands as it pours out of the tank, thus simulating conditions when burning oil boils over. To accomplish this, it was decided to use weak foam solutions.[4]

It was found that when these solutions were suitably diluted, the waves produced seemed to act in much the same way as a wave of frothing and steaming oil. The different shapes of wall were found to have essentially the same relative effectiveness as when water was used. It is felt therefore that the results of the water tests give a reliable indication of the relative value of different types and heights of wall for stopping waves of boiling oil.

Conclusions

The outsanding result of these tests (which comprised a total of more than 1000 "boil-overs" discharged against 66 different model walls or combination of walls) is the value of some form of velocity or energy "killer" other than the mere height of the wall. Probably the most important of those experiments tried is the coping, although a rough surface between the tank and the wall and the auxiliary walls and pits will probably each have a place.

The practical application of this principal to typical oil-storage conditions is illustrated in Fig. 15. Several concrete walls of the recommended form have already been built. On most of these walls, however, the coping has been made only about 4 inches wide. The tests have indicated that a heavier coping—say, 8 inches wide—will add considerably to the effectiveness of walls which are fairly close to tanks; and as this increase in the width would add a negligible amount to the cost, it would seem desirable.

As indicated by the curves on Fig. 13, a wall five feet high (model height, 4.3 inches) with an 8-inch coping is as effectual as a plain wall 9.6 feet high (model height, 8.2 inches). A five foot coped wall of standard T-shape will require about one-fourth cubic yard of concrete per linear foot at $30 per yard; this would cost $7.50 per linear foot. A wall, 9.6 feet high, would contain about 0.6 cubic yards, costing about $18. From these figures it is apparent that a given degree of protection for turning back a wave will cost only about one-half as much with a coped as with a plain wall.

An even greater economy is effected by the use of copings on earth walls. Over these, on account of their sloping sides, waves have a tendency to pass readily; but as soon as a 3 or 4-foot coping is placed at the top, a wall 5 feet high becomes much more effective than an uncoped wall 15 feet high. (See curves on Fig. 5.) Where scrap steel plates are available for building copings of the general form shown on

STOP PIPE CORROSION
IN SMALL LINES

Our Simplex Prepared Joint Cast Iron Pipe is made in 2″, 3″, 4″ or 6″ diameters. Since it has been available thousands and thousands of feet of this material has been used in the oil fields.

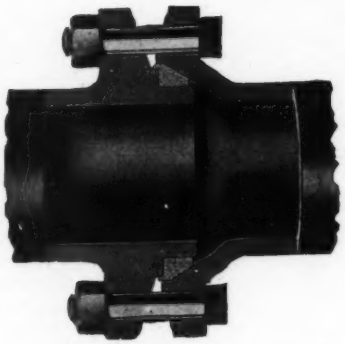

Illustration of section through assembled joint of Simplex Prepared Joint Five-Foot pipe, showing asbestos endless ring gasket in place. This gasket is adapted to use for oil, vapor and acid lines. A rubber gasket is compounded to suit the particular service it is to render—steam, natural gas, artificial gas, water, oil, etc.

Its chief advantage lies in its immunity from corrosion as compared with other ferrous pipe. Its desirability is further increased by the special joint, with only two bolts, and with a thick, endless ring gasket. It is rapidly and easily laid by inexperienced men.

Wherever permanent construction is desired, it is little short of an economic crime to spend money for a pipe line of perishable material when a practically permanent construction can be obtained by the use of cast iron.

Do you know why cast iron withstands corrosion so much better than any other ferrous metal? Our Bulletin No. 44 explains it.

Simplex Prepared Joint Pipe is furnished with full line of fittings. The material is fully described and illustrated in our Catalog No. 48. Your copy is waiting to be mailed upon receipt of your request.

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Write Also for Information on Our
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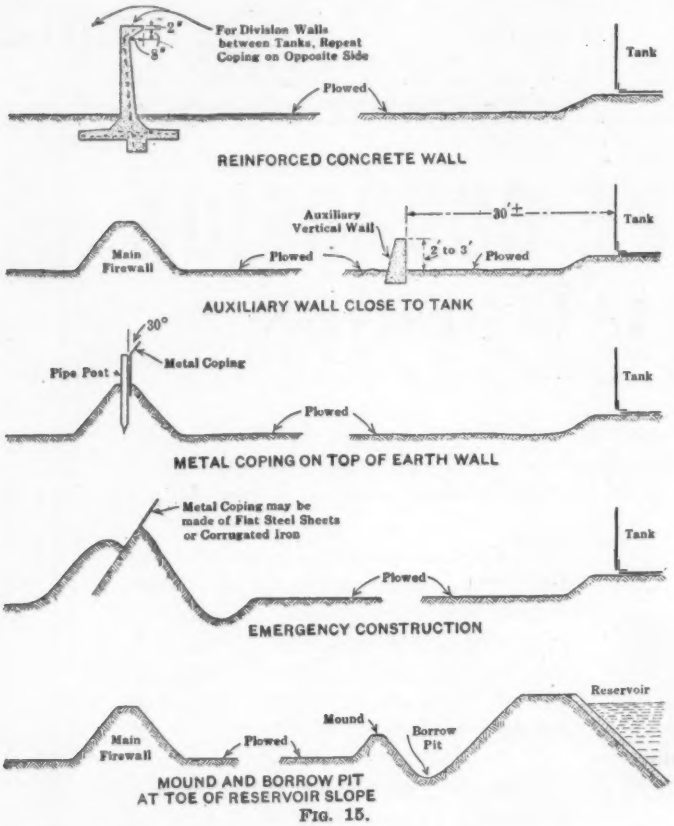

FIG. 15.

Fig. 15, the cost will be very low. Even where new galvanized-iron sheets have to be purchased, the cost figures indicate that a given effectiveness can be obtained with a coped wall at about one-quarter the cost of the high earth wall.

Where local conditions permit, a low vertical auxiliary wall about 30 feet from the base of the tank is an even more economical method of increasing the effectiveness of the main wall. This auxiliary wall breaks the force of the wave and robs it of the energy required to carry it over a main wall that it could otherwise easily surmount. On account of the smaller radius of this auxiliary wall, only about 60 per cent as much material is required to build it as for the coping on the main wall that would have equivalent effect.

A small mound 2 or 3 feet high with a borrow-pit toward the tank, and the slope made as steep as soil conditions will permit, will produce an effect similar to these small auxiliary vertical walls; but on account of the relative ease with which the wave passes over a wall with sloping sides, the mound is not nearly so effective as the vertical wall.

The same principle of breaking the force of the wave just as it starts can be applied in the case of reservoirs by building a small mound just at the toe of the reservoir slope. Another application of the same general principle consists of roughly plowing the surface of the ground between the tank and the fire wall. The tests indicated that this would serve to break up the energy of the waves sufficiently to enable a given wall to stop a considerably higher boil-over than if the surface between the tank and the wall were smooth.

A factor which adds materially to the value of this study has been the possibility of applying the principle to emergency construction. This was well illustrated in a recent crude fire in the Midway field in California. Four large tanks burned and boiled over, but the management was able to save the pump house and other buildings distant only about 160 feet from the nearest tanks, by throwing up emergency earth walls, against the back of which were placed corrugated galvanized-iron sheets which projected several feet above the top of the wall, and thus provided a coping tipped toward the fire. These walls proved entirely effective in stopping the boil-over and saving the buildings. (See Fig. 16).

Personnel

The tests herein described were conducted by the Technical Staff of Standard Oil Company of California under the direct supervision of the writer. The equipment was designed by Mr. A. Kremser, the tests were actually made by Messrs. H. J. Berg and E F. Post, and the results collated by Mr. G. O. Wilson,

APPENDIX

Preliminary Tests to Study Theoretical Applicability of Model and Performance of Apparatus

Theory of Model Application.—Although it was never intended to make quantitative use of these model experiments, it was hoped that in spite of the small scale they would show relative efficiencies among themselves. A number of exhaustive studies of the application of models to various engineering problems have been presented in recent years. In their paper[5] describing the experiments with models of the Gilboa Dam, R. W. Gausmann, M. Am. Soc. C. E., and C. M. Madden, Assoc. M. Am. Soc. C. E., stated that "if a model of a weir or channel is geometrically and mechanically similar to its prototype, the velocity will vary as the square root of the scale ratio."

In the model experiments here con-

Figure 16.—Emergency wall used in actual fire

[5]Transactions, Am. Soc. C. E., Vol LXXXVI (1923), p. 300.

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The choice of thousands of discriminating valve users for steam, oil, water, gas or air service, where pressure does not exceed 100 pounds.

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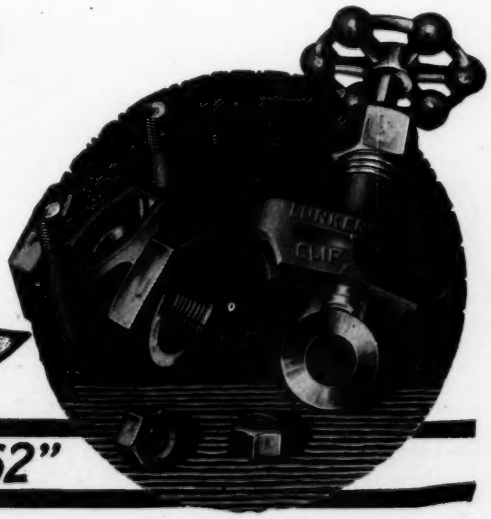

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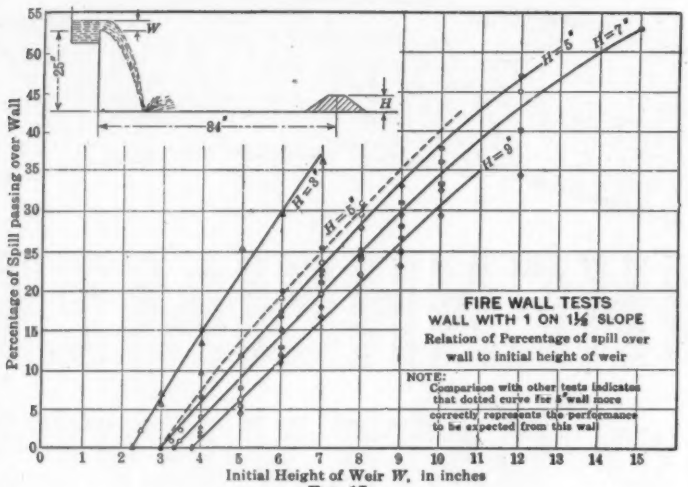

FIRE WALL TESTS
WALL WITH 1 ON 1½ SLOPE
Relation of Percentage of spill over wall to initial height of weir
NOTE:
Comparison with other tests indicates that dotted curve for 5" wall more correctly represents the performance to be expected from this wall
Percentage of Spill passing over Wall
Initial Height of Weir W, in inches
H=5"
H=6"
H=7"
H=8"
H=9"
84"

FIG. 17.

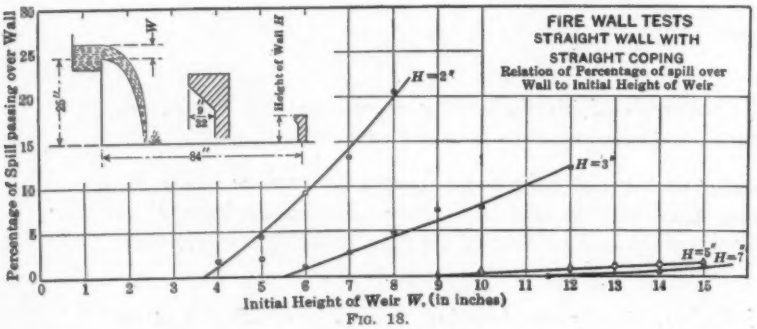


FIG. 18.

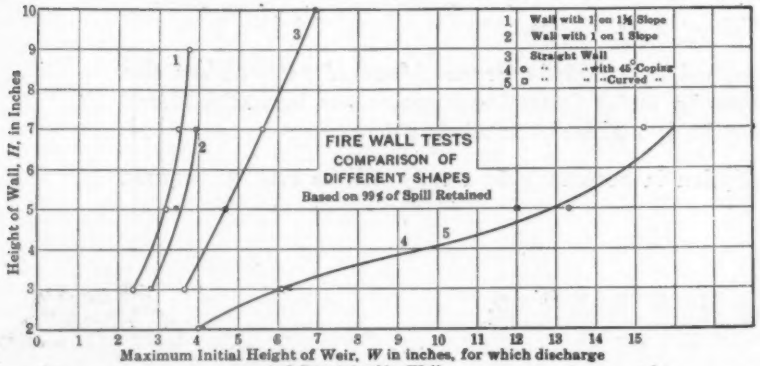

1 Wall with 1 on 1½ Slope
2 Wall with 1 on 1 Slope
3 Straight Wall
4 " " with 45° Coping
5 " " " "Curved "
FIRE WALL TESTS
COMPARISON OF
DIFFERENT SHAPES
Based on 99% of Spill Retained
Height of Wall, H, in Inches
Maximum Initial Height of Weir, W in inches, for which discharge is fully retained by Wall

FIG. 19.

sidered, the criterion of comparison is the height of wall which will be topped by various spills. As this height will be approximately proportional to the square of the velocity, and as the velocity, in turn, will be in proportion to the square root of the scale ratio, it would appear that the results of these experiments will be approximately in direct proportion to the scale ratio; or what is more important, will show approximately true relative proportions between different tests.

Performance of Apparatus.—In the first trials of the apparatus it was observed that considerable difference in the behavior of the wave resulted from apparently minor variations in the method of opening the gate. A standard procedure therefore was adopted in which the operator stood in a certain place and jerked the rope hard enough to throw the gate up with considerable impact against the supporting beam.

The next point to be investigated was the proper criterion for judging the performance of the different shapes and heights of model walls to be tested. It was at first felt that the maximum height of spill which any given shape should be credited with retaining was that for which the top of the wall and the space in the end of the trough outside of the wall (designated by A in Fig. 2, and spoken of hereafter as the "tail-board") remained absolutely dry. It was found, however, that this depended too much on accidental splashing when the wave hit the wall in some peculiar way; and it was finally decided that the criterion should be the condition where not enough water splashed over the wall to cause any measurable quantity to run off the tail-board.

To check the accuracy of the so-called "dry point" thus determined for each wall, the following procedure was adopted: Starting with a spill which would be large enough to throw a considerable percentage of water over the wall, a series of runs was made, gradually decreasing the size of spill until the dry point was reached. Several more runs were made after reaching this point with still smaller quantities, to make sure that these would be completely retained by the wall. By placing at the end of the tail-board a collector pan discharging into a 5-gallon can, the quantity of water passing over the wall in each test could be measured. These quantities were plotted as a percentage of the total quantity discharged in any given spill; and the intersection of the curve thus obtained with the base line gave a good check on the accuracy of the dry-point found. The curves of Figs. 17 and 18 are typical examples of these "percentage over" curves, whereas the final summarizing curves, Figs. 5, 12, 13 and 14, show only the dry points for the different sizes and shapes of wall. As explained (page 730), Fig. 19 compares the different shapes on the basis of 99 per cent of the spill being retained, instead of 100 per cent as in Figs, 5, 12, etc.

One other preliminary step before starting the actual comparison of different sizes and shapes of wall was to investigate the effect of varying the height of the box.

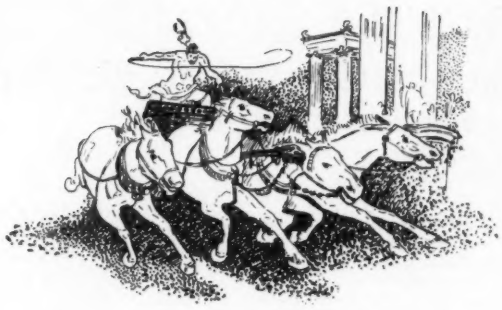
Contract Let

Contract has been let to the Cross-Widdell Engineering Company, Inc., of Kansas City, Mo., by the Solar Refining Company for installation at Lima, Ohio, for designing, furnishing and erecting six bubble towers on the continuous crude stills, building new condenser boxes, continuous flow lines, pumping equipment and other changes. The work will cost $125,000.

Effective July 1, L. J. Ferderber was appointed assistant to the first vice president of the General American Tank Car Corp., David Copland.

Enlarging Plant

Additional equipment being installed at the plant of the Gilmore Oil Company, at Vernon, Cal., will add 2500 barrels daily capacity.

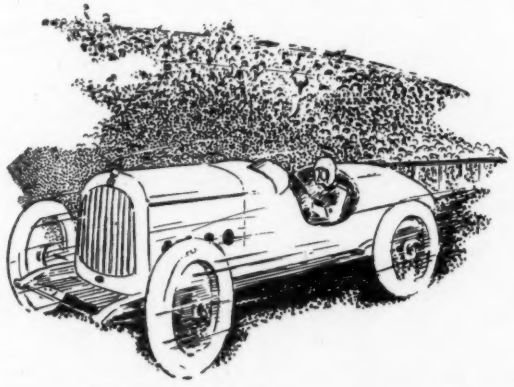


HORSE POWER

From the days when Ben Hur drove his four milk-white Arabians to a glorious victory, the advancement of civilization has depended upon horse power.

Then it was the question of super breeds of equine flesh, but today horse power means something different - it means modern gasoline motors, developed to the highest mechanical perfection.

These modern motors demand good gasoline. The best gasoline contains a large percentage of "Natural Gasoline", which gives it greater power and efficiency.



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Gasoline Prices Yielding to Pressure of Economic Changes

Pacific Coast excess now moving to Atlantic Ports, while Mid-Continent curtails run

By Grady Triplett,
Staff Representative

ALTHOUGH the production of gasoline for the first six months of this year was in line with the estimated demand, early in August the market yielded to the pressure of unusual conditions. The result was reduced filling station prices over large marketing areas.

Chief among the factors contributing to this break in the price structure was the movement of Pacific Coast gasoline to the Atlantic Seaboard for domestic consumption.

This pressure was felt by Mid-Continent refiners late in July, when orders from jobbers failed to hold up to the schedule of preceding months. By August the Mid-Continent market was in a sluggish state. Prices dropped a cent by the middle of August.

Of the many explanations offered for this condition, few included the movement of Pacific Coast gasoline to the Atlantic Seaboard. But California gasoline is being delivered to the Atlantic coast and loaded in tank cars at a total cost of 12½ cents a gallon. The price at California ports is 10½ cents. Loading, moving through the Panama canal, unloading from tankers and loading in tank cars can be done for 2 cents.

Crowding Mid-Continent

This condition leaves Mid-Continent gasoline out of consideration on the Atlantic Seaboard, as that combination of price and moving charges is below any combination that can be used in transporting Mid-Continent gasoline to the Atlantic coast.

Furthermore Pacific coast gasoline can be moved interior as far east as Ohio at a price to bring it in competition with gasoline from the Group 3 area. And that is being done at the present time, and will be continued, for contracts already made involve 236,250,000 gallons of Pacific Coast gasoline, for movement by tankers to Atlantic ports.

There it will be used in competition with the refinery output of the interior manufacturing centers.

Except as the affairs of the first half of 1925 may apply to the final six months of the year, the presentation of statistics have no bearing. But refiners, especially those of the Mid-Continent area, are now striving to adjust their operating plans to conditions and the California situation is a vital factor in this readjustment.

Refinery runs, shipments and stocks for the first half of the year are shown below:

	Gallons
Stocks on hand Jan. 1, 1925	1,298,925,717
Gasoline produced Jan. 1-July 1	5,202,381,919
Total	6,501,307,636
Shipments from refineries, Jan. 1 to July 1	4,695,216,371
Leaving stocks July 1, 1925	1,695,216,265

While this total of stocks for July 1 shows a material increase over January 1, the mid-year date stands at the peak of the motoring season, with three months of mounting consumption to follow.

Indicated Demand

Gauged by the number of automobiles registered, gasoline consumption for 1925 should run close to 10,718,879,410 gallons of gasoline for 1925. This is based on the number of automobiles, plus the net increase of gasoline exports over imports. It allows 500 gallons a year, as an average for each motor vehicle, an estimate a little above the average for the past four years, but lower than that for 1918, 1919 and 1920.

Automobile registrations and their realtion to gasoline consumption for the years in question follows:

Year	Cars in Service	U. S. Demand in Gals.	Average per Car in Gals.
1918	5,535,129	3,129,266,347	565
1919	6,851,045	3,434,812,486	501
1920	8,401,322	4,250,696,163	506
1921	9,855,885	4,516,027,256	458
1922	11,402,700	5,372,085,042	471
1923	13,806,214	6,685,035,280	484
1924	16,519,582	7,780,625,085	471
1925	19,172,554	9,586,272,000	500

Exports over imports should care for 1,132,607,410 gallons of gasoline, leaving the total for the year at 10,718,879,410 gallons for the year.

Such a consumption as this would mean an increase of 1,833,802,825 gallons in shipments from refineries of the United States for 1925. Actual shipments in 1924 were 8,885,076,685 gallons. To reach the 1925 estimate an increase of 26.06 percent.

That this is within reason is borne out by statistics recently issued in one of the Bulletins of the Western Petroleum Refiners' Association. Reports from gasoline inspectors of 32 states, covering the first five months of the year, showed an average increase of 27.50 percent in gasoline consumption for the whole country.

May Be High

It should be borne in mind that the percentage gain as calculated in each instance may be high. In the case of making deductions on the number of automobile registrations, 500 gallons has been allowed for an average consumption of each car, while the past four years have not been that high.

General economic conditions, undoubtedly have much to do with the average gasoline consumption per car. In estimating the number of cars for each year, the mean between the registrations of January 1 of that year and the number registered at the end of the year was taken. For 1925 only an estimate could be taken. Automobile sales have been running up to expectations for the first part of the year but to come to the end of the year with 19,172,554 motor vehicles in use in the United States, sales must continue at the rate that is indicated from the first six months and the scrapping of old cars must not run ahead of normal.

In the case of reports from State Inspector's offices, it must be remembered that gasoline that has been inspected has not been consumed. Neither does the report cover all states. Could the 48 states be listed, the average increase for the first five months might change either up or down.

General economic conditions also may pull the rate of consumption down for the last half of the year.

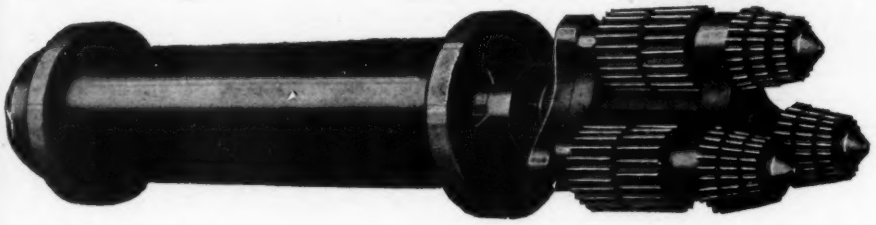
So the estimate of 10,718,879,410 gallons of gasoline as that to be consumed and exported in 1925 should be looked on as a high figure, rather than a low one.

Many refiners are considering 10,000,000,000 gallons as the consumption for the year. This is a safe figure, while 11,000,000,000 gallons is a liberal one.

The reoprt as based on replies from State Inspectors follows, as arranged for presentation to members of the Western Petroleum Refiners' Association:

INDICATED GASOLINE CONSUMPTION

	Gallons Gasoline Inspected First Five Months 1924	1925	% Increase
Southeastern States—			
Alabama	30,206,755	39,261,310	29.98
Florida	51,222,969	73,792,442	44.06
Georgia	46,409,718	54,332,642	17.07
Kentucky	26,966,757	33,875,957	25.62
Maryland	27,064,471	30,613,403	13.11
Mississippi	19,616,656	28,834,541	46.99
N. Carolina	55,830,653	77,874,839	39.48
S. Carolina	27,246,085	32,866,326	20.63
Virginia	37,751,157	44,564,273	18.05
W. Virginia	18,647,964	23,640,446	26.77
Total	340,963,185	439,656,179	28.95
Northeastern States—			
Connecticut	35,794,430	40,290,975	12.56
Delaware	5,604,514	6,115,442	9.12
Maine	10,287,144	13,472,751	30.97
New Hamp.	6,631,313	9,140,598	37.84
Total	58,317,401	69,019,766	18.35
Western States—			
Arizona	9,042,532	10,874,124	20.26
Colorado	31,019,604	34,834,465	12.30
Idaho	8,456,184	9,723,913	14.99
Nevada	2,814,756	3,106,126	10.35
New Mexico	6,226,010	7,654,164	22.94
Oregon	29,214,867	34,316,545	17.46
Utah	9,814,843	10,477,569	6.75
Washington	51,147,156	56,895,542	11.24
Total	147,735,952	167,882,448	13.64
Indiana Territory States—			
Indiana	82,405,797	94,359,293	14.51



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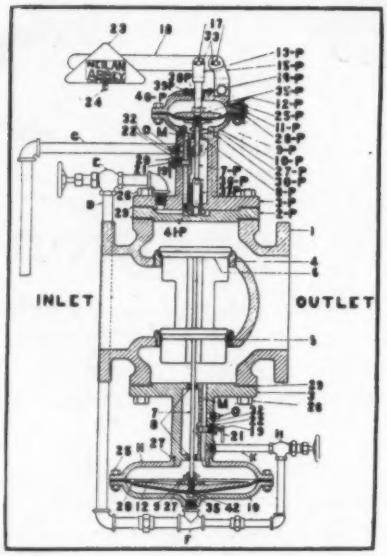


Pilot Operated Sensitive Back Pressure Regulator Introduced

Neilan, Abbey & Company, manufacturing engineers of Los Angeles, California, have recently developed an extremely sensitive back-pressure regulator which is particularly valuable in refineries and gasoline plants, when used in conjunction with a system for the conservation of gasoline vapors from storage tanks.

This regulator, when placed in the gas line from the tanks to a compressor or vacuum pump, will maintain a definite and constant pressure on the tank roof regardless of the vacuum carried on the compressor intake, according to the manufacturers.

In this system it is found best to carry from 10 to 15 inches of vacuum on the compressor intake, discharging the compressed gas into an absorption system, thereby recovering the gasoline which would otherwise have been lost by evaporation.

The Neilan Abbey Regulator works on the Pilot principle, using two diaphragms of proper proportions.

As the pressure rises in the tank or tanks, the Pilot valve (41-P in the accompanying cut) is partially opened, admitting pressure to the under side of diaphragm F, opening the main valve; and as the pressure falls, weight 23 closes the Pilot valve and the pressure equalizes through an adjustable by-pass H, closing the main valve.

By the use of this regulator a constant pressure of one inch of water may be held on the tank roof.

Additional information will be supplied by Neilan, Abbey & Company, 641-643 Santa Fe Avenue, Los Angeles, California.

Refinery Equipment Bulletins

Schutte & Koerting Company, Philadelphia, Pennsylvania, announce the publication of two bulletins on refinery equipment, copies of which may be had by writing the company and requesting them.

Bulletin 7 E deals with Everdur valves, fittings and jets. These specialties are made of a metal having high corrosion resisting qualities and are especially recommended for service in chemical lines.

Bulletin 9 M describes Schutte & Koerting magnetic oil strainers. The magnetic strainer consists of a cylindrical body containing a number of vertical magnets over which the oil passes, and a perforated strainer basket through which the oil flows after passing the battery of magnets. These magnets attract and hold the fine entrained steel grit. Foreign matter of a non-metallic character is separated from the oil by the perforated basket. The strainer is recommended for cleaning oil used in the bearings and speed reduction gears of steam turbines and internal combustion engines.

Jacket Water Cooler Prevents Overheated Engine Cylinders

All oil and gas engine and compressor operators, and especially those who have been troubled by scale formation in engine jackets, or excessive oil consumption, sticking piston rings, cylinder scoring and other evils arising from overheated cylinders, will be interested in the G-R Jacket Water Cooler.

This apparatus uses any source of raw water supply to cool the circulating water supply. A small amount of distilled water can therefore be continuously circulated through the jackets and the shell space of the cooler in a closed system, being cooled by the raw water passing through the cooler tubes.

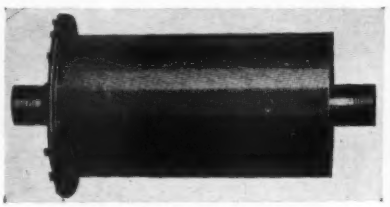
Besides being highly efficient in its cooling action, this apparatus is particularly compact, and constructed so as to permit easy inspection and cleaning. Full information can be obtained by addressing the manufacturers, The Griscom-Russell Company, 90 West Street, New York City.

Denver Gas Filter Cleans Gas Before it is Burned

To prevent gas depositing dirt or gum forming materials while it is being burned, the Metric Metal Works of the American Meter Company, Inc., Erie, Pennsylvania, is putting the Denver Gas Filter on the market.

This filter consists of two parts, the outer case the filter cartridge. The cartridge contains the filtering material on a filter bed, and is inclosed within the case. It is interchangeable with a new cartridge when the filtering material in an old cartridge becomes clogged or charged with materials removed from the gas.

The case is a welded cylinder approximately 8½ inches in diameter and 16 inches long, and contains two inch pipe

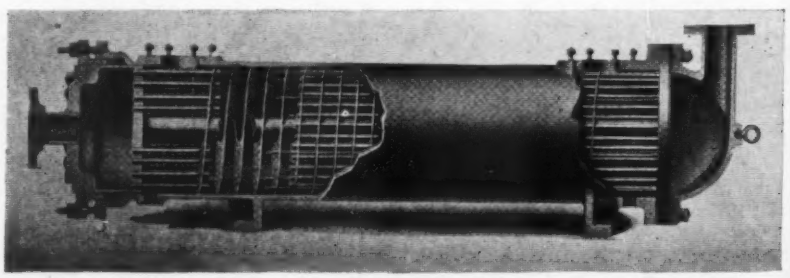


connections in each end. One end is closed with a solid welded-in head, and the other end is closed with a flange head bolted to the body of the case. The flange head is removed when it is desired to remove a charged filter cartridge and replace with a new cartridge.

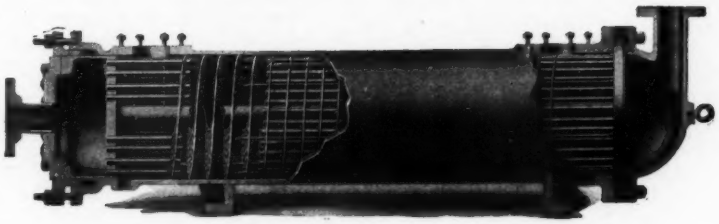
The cartridge is a tin cylinder containing the filtering material. It fits loosely within the case and is secured in place by its flange which is clamped between the flange and removable head of the case.

The filtering material consists of alternate layers of long fiber cotton and steel wool. It is necessary to pack the cartridge to very close specifications in order to secure maximum filtering efficiency with the minimum pressure loss through the filter.

Further information will be supplied by the company upon request.



Uses any raw water supply to cool engine jacket water



The G-R Multiwhirl Jacket Water Cooler

By eliminating the possibility of scale formation in the engine jackets

Will increase the operating efficiency and reduce the maintenance charges of oil and gas engines and compressors by preventing overheating troubles and assuring proper cylinder cooling effect.

With the Multiwhirl Jacket Water Cooler a small amount of distilled water can be circulated continuously through the engine jackets and cooled by any kind of raw water in passing through the Cooler. The unit is compact because of its high rate of heat transfer, is easily inspected and cleaned, and has several special advantages of construction that assure durability and trouble-free operation. Over 2000 are in service in every type of liquid cooling service.

Send the Coupon for Complete Information

THE GRISCOM-RUSSELL COMPANY

2135 West Street Building, New York

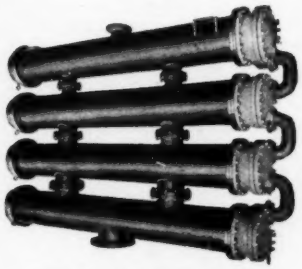
Philadelphia	Chicago	St. Louis	San Francisco
Boston	Cleveland	Kansas City	Los Angeles
Rochester	Detroit	Charlotte	Seattle
Pittsburgh	Milwaukee	New Orleans	Denver
Columbus	Indianapolis	Houston	Salt Lake City
	Minneapolis	Dallas	Tulsa

For Canada: Riley Engineering and Supply Company, Ltd., Toronto

Griscom-Russell

Heat Transfer Apparatus

Note these other G-R Units for lower refining costs



G-R Sectional Condenser

For condensing hydrocarbon vapors and other vapors

Can be used either as a standard or reflux condenser. The sectional arrangement permits using as a condenser and heat exchanger in one set or to obtain a different cut from each section.

Mineral Seal Oil Heat Exchangers

A compact, twin exchanger with strict counter-current flow to promote maximum rate of heat interchange

G-R Vaneflo Gas Cooler

For cooling casinghead or natural gas. Can be used as inter-, after-, or pre-cooler in absorption and compression type natural gasoline plants. Has low pressure loss and exceptional efficiency.

G-R Gasoline Condenser

For condensing natural gasoline vapors in casinghead gasoline plants. Can also be used as a knockout box or fractionating tower control section with particularly close control of the end points.

G-R Twin Heat Exchanger

For the efficient interchange of heat between crude oil feed stock and still bottoms, cold water and hot oil, feed stock and hot still vapors, etc

---

The Griscom-Russell Company.
2135 West Street Bldg., New York.
Please send information on

- ☐ Sectional Condenser
- ☐ Mineral Seal Oil Heat Exchanger
- ☐ Vaneflo Gas Cooler
- ☐ Jacket Water Cooler
- ☐ Gasoline Condenser
- ☐ Twin Heat Exchanger

Name . . . . . .

Address . . . . . .

R. 8-25.

Tell them where you saw the ad.

Waterproofing Bulletin

Engineers will be interested in a booklet published by the Truscon Laboratories, Detroit, Michigan, giving complete specifications on waterproofing mass concrete, waterproofing cement stucco, brick masonry, and various dampproofing paints, oilproofings, and quick-set for concrete. Each specification is complete with full information how to use, quantity required, and illustrations.

Ask for Specification Book "A," from The Truscon Laboratories, Detroit, Michigan, and a copy will be mailed you.

Fuel Oil—Its Uses and Methods of Observation

(Continued from page 19)

with the information of the original source from which the oil is obtained, and the treatment to which it is to be subjected.

The contractor will be required to deliver the oil specified in the proposal upon which contract is awarded.

"A" Fuel oil should be a hydrocarbon oil, free from grit, acid, fibrous or other foreign matter likely to clog or injure burners or valves. If required by the Navy Department it shall be strained by being drawn through filters of wire gauze, having 16 meshes to the inch.

The clearance through the strainer should be at least twice the area of the suction pipe and the strainer should be in duplicate.

"B" Unit of quantity to be barrels of 42 gallons of 231 cubic inches at a standard temperature of 60 degrees F. for every decrease or increase of temperature of 10 per cent or portion thereof from the standard, 0.4 per cent or 1 per cent or proper percentage should be added or deducted from the measured or gauged quantity for correction.

"C" The flash point should not be lower than 150° F. as a minimum, Abel or Pensky Martens closed cup, or 175 degrees F. Tagliabue open cup. In case of oil having a viscosity greater than 8 Engler at 150 degrees F. the flash point closed cup should not be below the temperature at which the oil has a viscosity of 8 Engler.

"D" Viscosity should not be greater than 40 Engler @ 70 degrees F.

"E" Water and sediment not over 1 per cent. If in excess of 1 per cent the excess to be subtracted from the volume or the oil may be rejected.

"F" Sulphur not over 1½ per cent.

Note:—If the Engler viscometer is not available, the Saybolt Standard Universal viscosimeter may be used.

Equivalent Viscosities

8 Engler.... 300 Seconds Saybolt
40 Engler....1500 Seconds Saybolt

Analysis

Calorific Value:—

The two methods for finding the heat of combustion are (1) calorimeter (2) chemical composition.

It is generally conceded that the first method is the most accurate although very close results may be obtained by calculation from the formula.

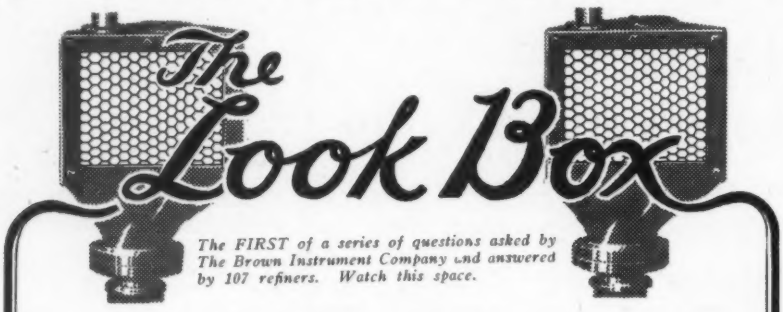
There are many types of calorimeters for this determination, among the most popular being the Parr, Mahler and Emerson. The principal of operation of calorimeters is practically the same. The sample is weighed in a small pan and ignition effected by electric means. The charge is burned in an atmosphere of pure oxygen, this insuring complete combustion. The heat is absorbed by water in a surrounding vessel.

During the operation a paddle run by a small motor keeps the water well mixed and a Beckman thermometer (graduated in hundredths degrees) is used for recording the increase in temperature. From this data the heat of combustion is calculated.

Chemical Reactions

Many chemical reactions occur when fuel oil is burned. On complete combustion carbon united with oxygen to form carbon dioxide, the hydrogen uniting with oxygen to form water, the sulphur burns to sulphur dioxide.

Whenever the sulphur dioxide comes into contact with the water it forms sulphurous acid, this is not likely however as the water, actually formed from the hydrogen of the oil uniting with oxygen, passes up the stack as superheated steam. Whenever complete combustion does not take place, carbon monoxide is formed



The FIRST of a series of questions asked by The Brown Instrument Company and answered by 107 refiners. Watch this space.

Question Asked: **"Do still men prefer Recording Thermometers and Pyrometers to Mercurial Thermometers?" 82% say 'YES."**

Answers:

"Gives them a better idea of condition the still is in."

"Although at first they resented the installation, they find they can operate now better with them."

"Enables men to fire more efficiently, by steady fire which is ever before him on his chart."

"Records any changes which may have been caused by another change in conditions remote from temperature, pressure, and so forth."

"Gives them an idea of how fast they are brought up to temperature."

"They prefer a continuous record."

"Easy to read—can be placed conveniently."

Among the reasons the other 18% gave for prefering Mercurial Thermometers was because of the time element in changing charts, but one recording instrument enthusiast says: "Would be worth using if it took fifteen times as long."

Watch this space.

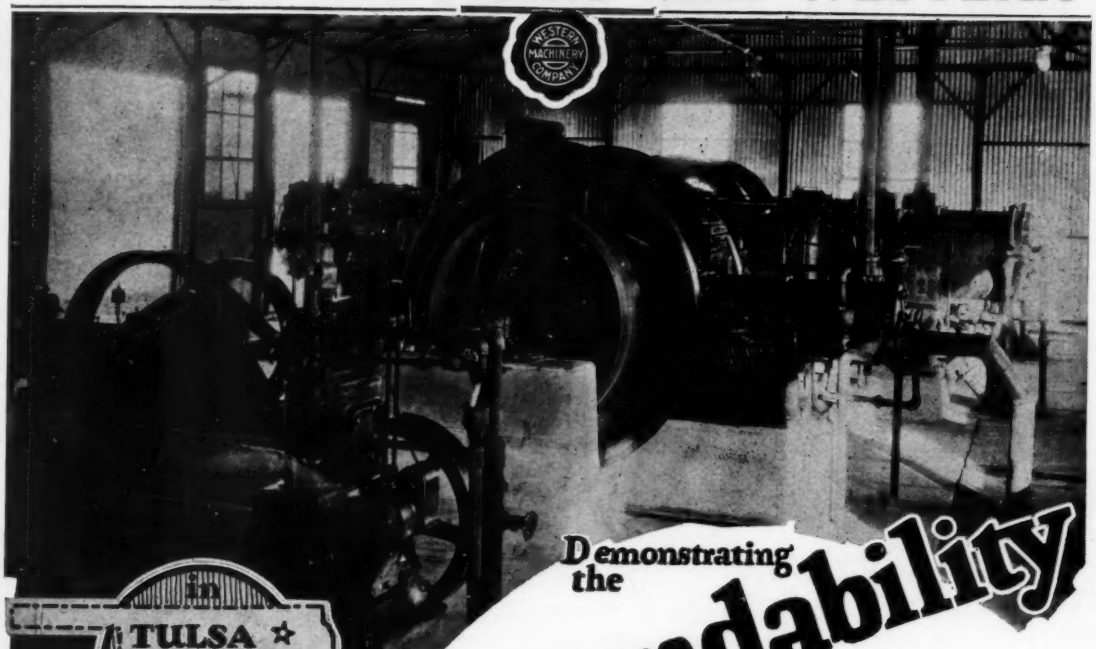
For Catalogs and specific information,

Address—The Brown Instrument Company, 4537 Wayne Avenue, Philadelphia, Pa., or one of our district offices in New York, Boston, Pittsburgh, Detroit, Chicago, Birmingham, Houston, Tulsa, Denver, Salt Lake City, San Francisco, Los Angeles or Montreal.

Brown Instruments

TEMPERATURE: PRESSURE: CO_2

"Through the Fields with WESTERN"



In TULSA ☆ OKLAHOMA

Demonstrating the Dependability of "WESTERN"

"Western" Duplex and Twin-Duplex Gas Engines 80-320 H.P. Two and four cylinder Units.

Type "G" Gas Engines 25-60 H. P. Single Cylinder

Oil Field Engines 25-50 H. P. Single Cylinder

Type "C R" Single Speed Reverse Gear

Type "D R" Two-Speed Reverse Gear

Diesel Engines 30-250 H.P. Single and Multiple Cylinder Units

Write for Bulletin.

Every individual who ever has had anything to do with power equipment in oil country work knows how much depends upon a single engine that supplies power for the entire plant, when that engine is not backed up by an auxiliary unit. Should it stop, all work ceases immediately and losses pile up quickly. . . . . It takes nerve, *or a lot of confidence* to rely upon one engine to operate a complete plant of this kind. . . . . The engine in the plant above is a Type "G22" 40 H. P. "Western" Gas Engine, equipped with a "Western" Gas Mixing Box and "Western" Throttling Type Governor, which insures smooth, full-power impulses under all loads. A "Western" Type "BE" Air Starting Unit is shown in the foreground. The operation of this plant has been 100 per cent now for a period of eleven months, and will continue so for many months longer. It furnishes a very good example of the practical dependability of "Western" Engines, and the trust which operators can place upon them with every assurance of fulfillment. . . . . The outstanding dependability of "Westetrn" Engines is one of the topics of discussion in oil country power circles.

Western Machinery Company

General Offices & Factory: 903 North Main St., LOS ANGELES, CALIFORNIA

720 So. Kenosha St. Tulsa Oklahoma

San Francisco Office and Factory: Eighteenth and Alabama Streets

1106 Nineteenth St. Bakersfield California

and this results in a great loss of heat. There should never be much excess of oxygen for more harm than good results from this practice.

Nitrogen is sometimes present in the oil but this element goes up the stack unchanged.

It is impossible to have complete combustion taking place in the combustion chamber with clouds of black smoke rolling out of the stack. This color is due to unburned carbon escaping which means that the proper amount of oxygen is not being furnished.

Acid:—The usual test for acid must be made and if present in any quantity the oil should be rejected.

Impurities: — This covers water, sand, grit and practically all substances insoluble in oil.

In making this test a graduated tube or pear shaped flask is used and 50 per cent oil and 50 per cent light gasoline mixed thoroughly and centrifuged until a clear line of demarcation exists between the impurities and the oil.

Sulphur:—The sulphur may be determined by means of the calorimeter at the same time the heat of combustion is being determined—the washings from the bomb acidified with hydrochloric acid and sulphur precipitated as barium sulphate.

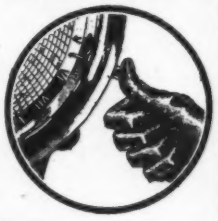
Flash Point:—The flash point is the temperature at which the oil gives off inflammable vapors and is determined by means of the Pensky-Marten, Pensky-Abel or Tagliabue closed cups or the Cleveland open cup.

Viscosity:—This is an index to the temperature at which the oil will flow freely and is important in that the oil must flow or be pumped through the fuel feed line as an oil of too great a viscosity would not flow prperly.

Who's Responsible for this Error?

You can immediately place your finger on the man responsible when goods are ruined or other damage occurs as a result of not maintaining the correct temperature provided you use Columbia Recording Thermometers. For the man in charge at the time the bright red line on the chart shows too big a temperature variation is the one responsible.

Moreover, you can tell whether he carefully watched the temperature. If he didn't push the button every time the temperature was supposed to be taken there will be no hole in the chart. And it's up to him to explain WHY.



Columbia

Recording Thermometers

With Time Punch

protect the manufacturer as well as the workman. Time punch holes at the correct points in a chart are absolute proof that the workman carried out instructions as to inspection.

Columbia Recording Gauges and Tachometers are also equipped with the time punch without additional charge.

Send for Catalog H-16

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*Stock carried at these branches.

1850 1925 75th Anniversary

Gasoline Prices Yielding to Pressure of Economic Changes

(Continued from page 42)

Minnesota	63,740,555	79,918,800	25.38
Missouri	64,718,200	90,285,000	39.50
No. Dakota	13,339,231	20,664,120	54.91
So. Dakota	19,145,601	22,684,943	18.49
Total	243,349,384	307,912,156	26.53
Mid-Continent States—			
Arkansas	19,497,486	29,507,754	51.34
Kansas	60,841,800	79,312,650	30.36
Louisiana	35,954,355	44,827,574	24.68
Oklahoma	47,173,869	66,057,336	40.03
Texas	127,394,715	174,413,720	36.91
Total	290,862,225	394,119,034	35.50
All above states	1,081,228,147	1,378,589,583	27.50

From the Bulletin of the Western Petroleum Refiners' Association.

Drawing the situation down to a smaller area, the Mid-Continent seems more vitally affected than any other section. Pacific Coast refiners are sending gasoline to the Atlantic seaboard by tankers. Already contracts have been executed for 76 cargoes, while others will follow, at least until prices in the Mid-Continent are such that this gasoline can compete with the West Coast product.

Unusual Movement

Another condition the Mid-Continent refiner must consider is that he has enjoyed a volume of business during the first five months of this year in excess of his part in the corresponding period of 1924. During the first five months of 1924, the Mid-Continent area furnished 22 percent of the total gasoline shipped from all refineries of the United States.

For the first five months of 1925 the percentage was as follows:

January	27.5
February	27.

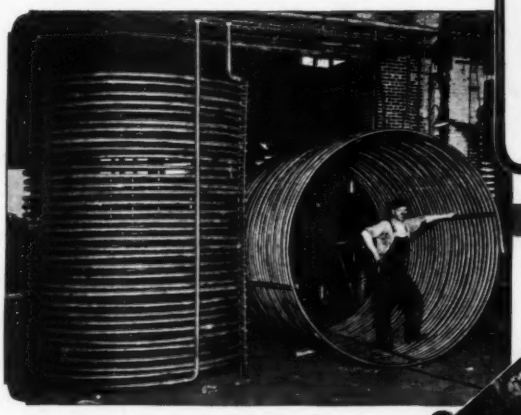
Lunkenheimer Valve Bulletin

Lunkenheimer valves are featured in a 16-page bulletin recently issued by the Lunkenheimer Company, Cincinnati, Ohio. These valves are used extensively by refineries and have established an excellent reputation for service.

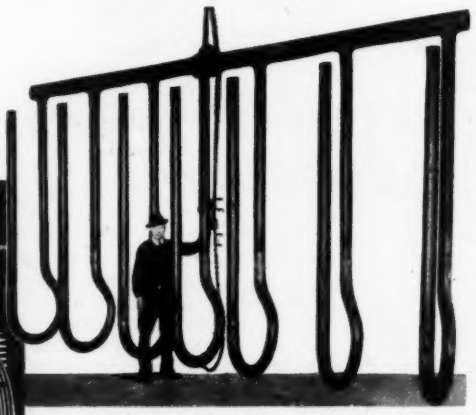
Copies of the bulletin, "Guide to Better Service", will be mailed any one requesting them from the company.

Tank Cars Bought

Cities Service Tank Line Company has purchased 79 additional tank cars for the further service of the Cities Service Refining Company of Massachusetts and the Cities Service Oil Company of Ohio, according to a statement made yesterday by Henry L. Doherty & Company. The total number of tank cars owned and operated by various Cities Service subsidiaries now is 3,000.



Continuous welded spiral coils 10' 0" dia.-2" pipe



Manifold from 4" and 6" standard weight pipe

90° Bend on 10' 0" radius from 24" O.D. pipe with ½" wall

MIDWEST Piping Service to the Oil Industry

ARE you ever puzzled by some piping problem which confronts you? Do you ever wonder how you will get the required amount of condensing or heat exchanging surface in the space available? Or are you ever undecided how to take care of expansion and contraction? These are only a few piping questions that arise—you probably can add many more.

If you are confronted with such problems, the Midwest Piping & Supply Co. can be of very definite service to you. This organization devotes its entire ability, energy, and time to pipe fabrication and the solution of piping problems. Our engineers are trained "pipe men" and their long and varied experience is at your command.

Your problem will indeed be unusual, if we have not previously had several very similar to it.

And if you know exactly what piping you require, we will follow your instructions accurately and intelligently.

Midwest Piping for the Oil Industry includes bends, continuous welded coils, headers, and fabricated pipe of all descriptions for operating conditions varying from vacuum to highest pressures and temperatures. The pipe joints are Midwest, Van Stone, or screwed flange type according to requirements of the particular service.

Midwest facilities are unexcelled for accurate and immediate production. Large and complete stocks of valves and fittings are maintained for prompt assembly with fabricated piping. Our location is also to your advantage.

When you need fabricated piping—write, wire, or phone Midwest.

MIDWEST PIPING & SUPPLY CO.

Second and Miller Streets
St. Louis, Mo.
Tulsa Office: 615 Petroleum Building. Phone 2-3583

Fabricators of Oil Refinery, Natural Gasoline Plant and Power Piping

Tell them where you saw the ad.

March	24.5
April	25.
May	24.5
Average for the period	24.7

Sales in big volume on export contracts, contributed largely to this unusual increase over 1924. With Pacific Coast gasoline available at its present figure, indications are against any such continuation of an abnormal share of the whole gasoline shipments of the country.

The contrary may be true, as the Mid-Continent may furnish a share below this allotted 22 percent for the final seven months of the year, thereby bringing this average for the year down to a figure close to that of 1924.

Refinery runs for the Mid-Continent area for the first five months of this year are shown in the table below:

	Gasoline Produced	Gasoline Shipped	Stocks on Hand	Increase* or Decrease† in Stocks
January	203,434,182	185,688,235	161,717,000	17,745,947*
February	195,048,091	171,279,392	185,486,509	23,769,509*
March	216,260,484	179,275,725	222,471,268	36,984,759*
April	214,581,279	228,028,865	209,023,682	13,447,586†
May	236,188,573	248,845,726	196,366,529	12,657,153†

These figures show the Mid-Continent area with increased gasoline stocks, although shipments have been in excess of other years and in excess of what had been anticipated for the period, as well as at a rate higher than that reasonable to expect for the whole year.

Another factor in the gasoline output of the nation is the growing use of equipment that will convert greater portions of crude oil into gasoline. In 1918, 30 percent gasoline recovery was the average for the Mid-Continent area. In May of this year it rose to 42 percent in the Mid-Continent.

Gasoline Yield Upward

While other sections show corresponding gains in gasoline recovery, the Mid-Continent refiner is up against the situation of converting his skimming plant into one equipped for cracking, despite the fact that it means increased gasoline for a market already apparently overloaded.

Cracking process thrived first in the larger refining centers, those on the New Jersey Coast, the great Chicago territory and the Texas Gulf Coast. While few plants had cracking processes, their combined capacity was great.

In the Mid-Continent the plants are small, compared with the great refining center plants. These small plants are surely turning to cracking processes and the change is being felt in increased yield of gasoline from a given amount of crude oil.

The yield of gasoline from crude oil is shown in the following table of Mid-Continent refinery operation:

Period	Crude Oil Charged to Stills Barrels	Gasoline Output, Gallons	Per Cent Yield
1918	79,778,450	1,015,587,100	30.30
1919	82,124,900	1,073,715,880	31.13
1920	102,020,475	1,339,693,365	31.26
1921	93,972,400	1,332,111,150	33.74
1922	101,287,125	1,555,861,800	36.56
1923	101,035,375	1,633,369,240	38.5
1924	123,355,985	2,076,557,650	40.08
Jan. 1925	11,724,750	203,434,180	41.3
Feb.,	11,243,290	195,048,900	41.3
March	12,211,300	216,260,500	42.17
April	12,228,600	214,581,300	41.79
May	13,137,500	236,188,500	42.80

As refinery runs are curtailed and plants are shut down, something now taking place in the Mid-Continent, the percentage of gasoline from crude oil will increase throughout the Mid-Continent. For the plants that will be shut down will be skimming plants.

Already two skimming plants of the Sinclair Refining Company have been shut down. This is a custom with the company. The skimming plants are operated when prices are such that a profit can be shown. When curtailment is necessary, the plants equipped for most economical operation are kept in service.

That curtailed runs will result from the present situation is certain. In fact runs in the Mid-Continent have already dropped below the May and June figures. How much more of this is to take place is dependent on prices and the view refinery executives take regarding statistics and the general economic condition of the country.

We can supply your immediate requirements for Class IV Insulated Tank Cars. Write or wire us now for lease quotations on Conley Cars that give efficient S-E-R-V-I-C-E.

CONLEY TANK CAR COMPANY

OLIVER BUILDING
PITTSBURGH, PA.

MAGNOLIA BUILDING
DALLAS, TEXAS

Tell them where you saw the ad.

Evidence

The Best Evidence of Worth—Those Who Buy and Repeat

TO name the users of Oceco Equipment is like calling the roll of leading oil companies.

The fact that these companies and many others use Oceco Equipment and know its value **by experience** is unquestionable evidence that **it pays** to so equip.

And **additional** evidence is their repeat business.

We appreciate this confidence in Oceco Equipment and have pledged ourselves to continue to merit it in quality of product and character of service.

Among the users are:

Argentine Government Refinery
Associated Oil Co.
Atlantic Refining Co.
Barnsdall Refining Co.
Beacon Oil Co.
Buckeye Pipe Line Co.
Carter Oil Co.
Cities Service Refining Co.
Cumberland Pipe Line Co.
Henry L. Doherty Co.
Ford Motor Co.
General Petroleum Co.
Great Southern Refining Co.
Gulf Refining Co.
Humphreys Pure Oil Co.
Humble Oil & Refining Co.
Invincible Oil Co.
Louisiana Oil Refining Corp.
Lubrite Refining Co.
Magnolia Petroleum Co.
Marland Refining Co.
Mexican Petroleum Co.
Midwest Refining Co.
National Refining Co.
Pan American Petroleum & Transport Co.
Paragon Refining Co.
Phillips Petroleum Co.
Pierce Petroleum Co.
Pure Oil Co.
Roxana Petroleum Co.
Russian Soviet Government
Shell Oil Co.
Sinclair Refining Co.
Southern Pacific Co.
South Penn Oil Co.
Standard Oil Co. of Indiana
Standard Oil Co. of Kentucky
Standard Oil Co. of Louisiana
Standard Oil Co. of New Jersey
Sun Oil Co.
Texas Pacific Coal & Oil Co.
Vacuum Oil Co.
White Eagle Oil & Refining Co.

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CLEVELAND, OHIO

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325 Iowa Building, Tulsa, Okla.
O-S Building, Casper, Wyo.
318 East 12th St., Los Angeles, Cal.
440 Howard St., San Francisco, Cal.
W. K. Henderson Co., Shreveport, La.

Beaumont Export and Import Co., Beaumont, Texas, and Tampico, Mexico.

OIL TANK **OCECO** EQUIPMENT
SAVES EVAPORATION AND PREVENTS FIRE

RECENT REFINERY PATENTS

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry were granted by the United States Patent Office during the month of July:

No. 1,544,734, granted July 7 to Luther D. Fulton, Titusville, Pa., assignor to the DeLaval Separator Co. of New Jersey, for a method of separating wax from mineral oils containing the same in solution, which comprises slowly flowing a large volume of oil along a downward path without agitation and without substantial change of direction, the oil being maintained in a stream of large cross-sectional area as compared with the length of its path of travel, subjecting the flowing oil to gradual and progressive cooling by indirect contact with a cooling medium, passing upwardly counter-current to the flowing oil, and subjecting the oil so cooled to centrifugal separation.

No. 1,544,747, granted July 7 to Cyrus Howard Hapgood, Nutley, N. J., assignor to the DeLaval Separator Co., New York, for an apparatus for treating lubricating oils containing waxes in solution to continuously separate the wax from the oil, comprising a preliminary double pipe chiller and a final double pipe chiller, said chillers comprising a continuous conduit through which the solution of oil and wax is adapted to continuously flow, each of said chillers comprising also a second conduit arranged in heat exchange relation with the first conduit and through which the chilling fluid is passed, and a centrifuge communicating with said first conduit and into which the refrigerated stock is adapted to continuously feed, said centrifuge having a discharge for wax-free oil communicating with the second conduit of the preliminary chiller.

No. 1,545,210, granted July 7 to Archibald Donald Stewart, Westbury, N. Y., for an apparatus for reclaiming gasoline comprising a tank, a partition defining a sump at the lower end of the tank and having an opening for communication between the sump and tank, a plurality of distributors substantially symettrically arranged in the sump, a pipe fitting and pipe branches leading therefrom to the distributors, a preliminary chamber connected to said pipe fitting, means for supplying dirty cleaning liquid to the preliminary chamber and means in said chamber for effecting preliminary separation of extraneous matter from the cleaning liquid.

No. 1,545,261, granted July 7 to Arthur N. Kerr, Pittsburgh, Pa., for a liquid fuel comprising a cut of natural gas condensate having an initial boiling point now lower than about 10 degrees F., a final boiling point not higher than about 150 degrees F., a gravity of from about 94 degrees to 120 degrees Baume, and a vapor tension of from about 15 to 20 pounds at 70 degrees F.

No. 1,545,896, granted July 14 to John Hanlon, Bayonne, N. J., for an apparatus for washing sediment from oil tanks, comprising the combination of a pipe, a discharge nozzle on the end of the pipe, means within the tank supporting the nozzle for translatory movement in a horizontal plane, and means operable from the exterior of the tank for moving the nozzle in a vertical plane.

No. 1,545,949, granted July 14 to Carleton Ellis, Montclair, N. J., assignor to Standard Development Co., of Delaware, for an apparatus for the manufacture of gasoline by cracking a heavier oil, the combination of housing and furnace setting equipped with a fire box, above said fire box a nest of heating pipes united end to end to form a continuous, tortuous passage, a drum superposed above said pipes and connected therewith, the cross sectional area of said drum being relatively very much larger than the cross sectional area of the heating pipes, a single outlet for said drum, a cooler attached thereto, said cooler being provided at its discharge end with a valve, whereby the entire apparatus may be maintained under pressure; and means for causing oil to pass through said heating pipes into said drum.

No. 1,546,055, granted July 14 to Winfred E. Wilson, San Pedro, and Howard W. Wilson, El Segundo, Calif., for an apparatus for treating hydrocarbons comprising a chamber having an inlet and an outlet and divided into a plurality of compartments, the dividing walls of said compartments provided in the bottom thereof with openings, a vapor outlet for each compartment, means in the various compartments for maintaining the oil levels constant, and a plurality of series of superposed pipes within said compartments for heating the oil therein to progressing temperatures.

No. 1,546,285, granted July 14 to Jay Buchan Kirk, Iola, Kans., for an apparatus for the distillation of carbonaceous material, consisting of a combustion chamber, a heating chamber at one side of the combustion chamber and communicating therewith, a flue below the combustion chamber and communicating with the heating chamber, a preheating chamber below the flue and communicating therewith, a vertical pipe in the heating chamber, a tank below the lower end of said pipe and communicating therewith, a pipe in the preheating chamber and connected with a supply pipe and said tank, and a vertically reciprocating scraper in the pipe in this heating chamber.

No. 1,546,634, granted July 21 to Carbon F. Dubbs, Wilmette, Ill., assignor to Universal Oil Products Co., Chicago, for an apparatus for converting oil, comprising a furnace, a heating coil therein, an enlarged insulated chamber disposed outside of said furnace, an insulating wall around said chamber, a transfer line between the heating coil and the chamber, a dephlegmator disposed at an elevation above the heating coil in said furnace, a vapor transfer line from said chamber to said dephlegmator, a residual drawoff line leading from the chamber, means for introducing charging stock to the dephlegmator to absorb heat from the vapors passing therethrough and to preheat the charging stock, means for collecting a body of said charging stock and reflux condensate, a communication between said collecting means and the heating tubes for introducing the charging stock and reflux condensate to the heating tubes, and means for maintaining a superatmospheric pressure on the oil undergoing conversion.

No. 1,546,655, granted July 21 to Felix C. Hamilton, Beloit, Kansas, for an oil separator comprising a pair of casings, means for connecting said casing into a pressure oil feed line to form a part thereof and to operate under the pressure therein, an oil pipe leading into one of said casings adjacent the upper end thereof and extending downwardly therein and having a distributing head at its end, a baffle plate below said distributing head, a water overflow pipe leading from the lower portion of the casings and discharging therefrom at an elevated point and above the distributing head, an elongated horizontal header to which the lower portion of the casing is connected, a steam pipe extending through said header, and exhaust steam line to which said steam pipe is connected, means for supplying live steam to a part of the exhaust steam line and from said part of the exhaust steam line to the steam pipe while preventing the passage of said live steam to the remainder of the exhaust steam line.

No. 1,546,659, granted July 21 to Emanuel W. Hartman, Miami, Fla., for

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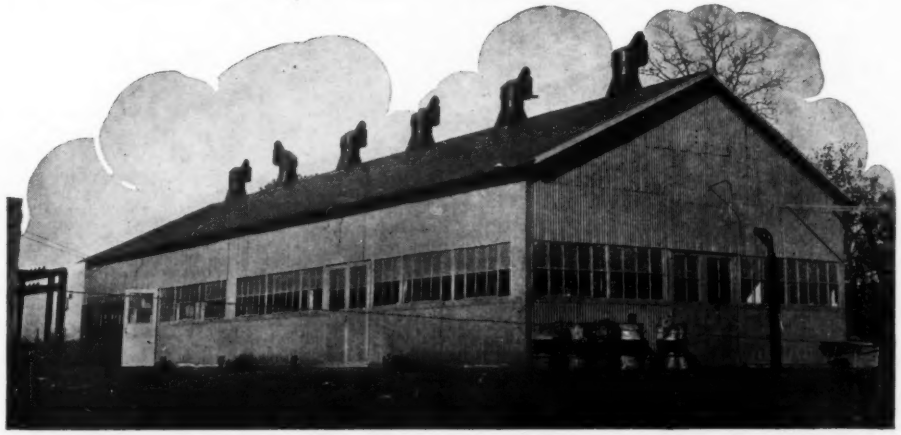

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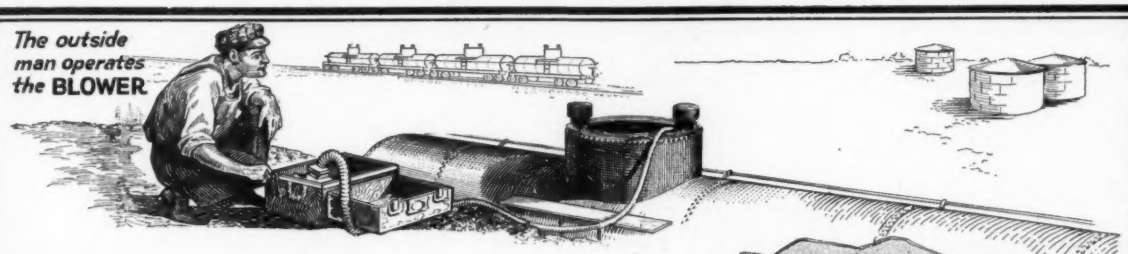
No. 1,547,090, granted July 21 to Eugene A. Whitten, Santa Fe Springs, Calif., assignor of one-third to Ernest E. Anderson, Brea, Calif., and one-third to Shannon A. Erwin, Santa Fe Springs, Calif., for an oil and gas separator comprising a shell, an annular foraminated diaphragm mounted in the shell, a casing mounted on the diaphragm and extending upwardly and forming an annular chamber above the diaphragm, the chamber of the shell below the diaphragm being an oil chamber, a valve casing near the lower end of the shell, a float in the shell, an oil outlet pipe extending through the outer end of the valve casing, a valve having a curved face upon the inner end of the outlet pipe in the valve casing, a curved shutter member slidable on the curved face, levers pivoted to the oil outlet pipe and having a pivotal connection to the shutter and a link connected to the levers and to the float and adapted to operate the shutter, an oil drain having a valve at the bottom of the shell and an oil inlet to the annular chamber.

No. 1,547,100, granted July 21 to Zeno E. Daughdrill, Corsicana, Texas, for an apparatus for treating oil including a tank having an oil outlet and a water outlet at different levels respectively, a pipe opening into the lower portion of the tank, for delivering a mixture of oil and water to the tank, a delivering pipe extending from said first named pipe having an outlet opening into the tank, a steam nozzle within the outlet pipe, a steam pipe communicating with the nozzle, and a water inlet pipe opening into the steam pipe for directing water into said steam pipe from the interior of the tank.

No. 1,547,191, granted July 28 to Lyle Stockton Abbott, River Edge, N. J., assignor to Gulf Refining Co., Pittsburgh, for a process of improving low grade petroleum oils by cracking which comprises spraying such an oil into a hot current of producer gas at such a temperature as will suffice to raise the oil and gas to a cracking temperature suitable for the production of gasoline, cooling the mixture, removing whatever condensate forms and



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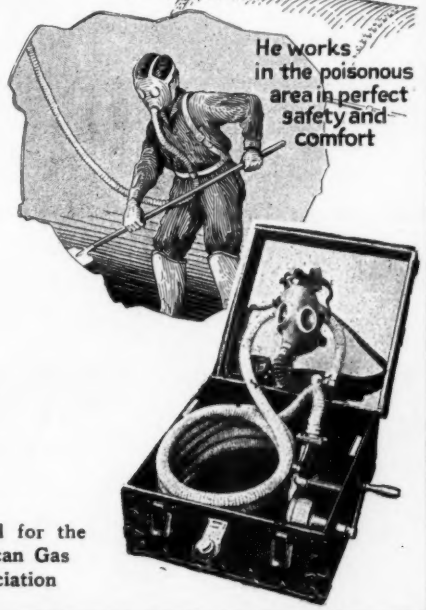

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scrubbing the residual gases and vapors with a high-boiling oil.

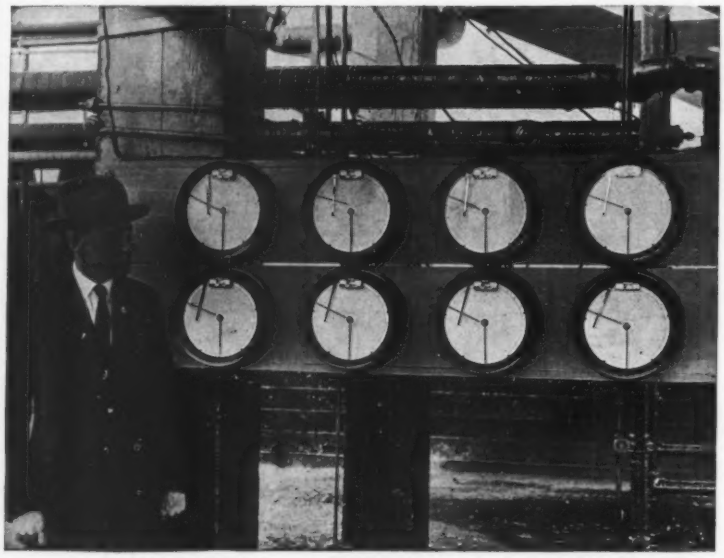
No. 1,547,682, granted July 28 to Paul W. Prutzman, Los Angeles, assignor to General Petroleum Corporation of California, for a method of purifying and partly decolorizing hydrocarbon oils which consists in intermixing with the oil to be treated a powdered solid adsorbent, heating the mixture in a substantially closed vessel to a temperature at which the oil decomposes appreciably, to permit the adsorbent to withdraw the maximum quantity of coloring matter from the oil, steaming the hot mixture to carry off the decomposition products evolved, and finally separating the spent adsorbent and its contained coloring matters from the decolorized oil remaining in the vessel by mechanical means.

No. 1,547,712, granted July 28 to Charles V. Zoul, Santa Monica, Calif., assignor to the Celite Co., Los Angeles, for a process for treating emulsions of oil and water which consists of mixing wood pulp with pre-dried oil of the same character as in the emulsion, allowing such mixture to flow through a filtering machine at low pressure and at a high rate of flow so as to form a coating of wood pulp on the filtering medium of said filtering machine, forcing the emulsion through such coating and subjecting the filtrate to separating action to separate the constituents thereof.

No. 1,547,993, granted July 28 to John E. Bell, Brooklyn, N. Y., and Edward W. Isom, Winnetka, Ill., for a pressure still, comprising a drum to receive the oil to be cracked, partitions in the drum dividing it into a series of communicating compartments, means for feeding oil into the first of said series of compartments, and permitting it to flow successively into the other compartments, a furnace having an elongated heating flue, a corresponding series of separate heating coils connected to the respective compartments of the drum and located in the heating flue, the coils being arranged in the latter to be impinged upon by the heating gases from the furnace in the same order as the compartments with which they are connected receive the oil, the successive heating coils being of increasing heat absorptive surface to offset the decline in temperature of the heating gases along the heating flue.

No. 1,547,994, granted July 28 to John E. Bell, Brooklyn, N. Y., and Edward W. Isom, Winnetka, Ill., for a pressure still, comprising a drum, a series of partitions dividing the drum into successive compartments, there being openings in said partitions through which the compartments communicate, means for supplying oil to the compartment at one end of said drum, a furnace having a heating flue, a series of separate heating units corresponding to the successive compartments in the drum each being connected to one of the compartments and extending into the heating flue, the heating unit connected to the compartment at the supply end of the drum being arranged in the heating flue nearest the furnace, and pumps connected to the respective compartments and heating units for circulating oil from the compartments through the heating units and back to the same compartment.

No. 1,548,004, granted July 29 to Lyman C. Huff, Chicago, assignor to Universal Oil Products Co., Chicago, for an apparatus for removing carbonaceous material from oil apparatus, comprising of the combination of an enlarged reaction chamber wherein carbon is precipitated and collected during the conversion of oil, of a flexible metal member releasably supported within said reaction chamber at a plurality of different vertical points thereof and adapted to be distributed vertically throughout the deposited carbon collected in the chamber and to be withdrawn from said chamber to disrupt the entire mass of such deposited carbon.



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Following the example of several hundred of the largest refining companies in the United States a prominent Southern California Oil Refining Company has equipped its battery of stills with Foxboro long distance type recording thermometers and a Foxboro Pressure Gauge for recording boiler pressure. The installation is shown above.

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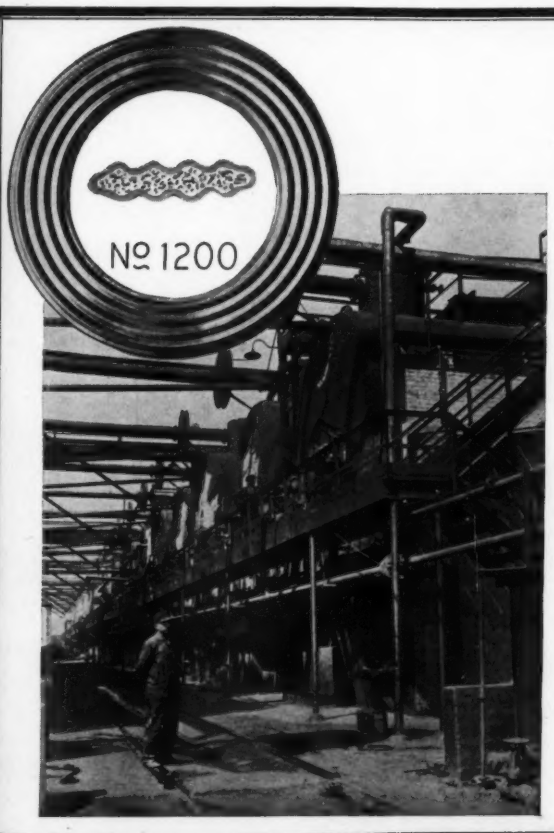

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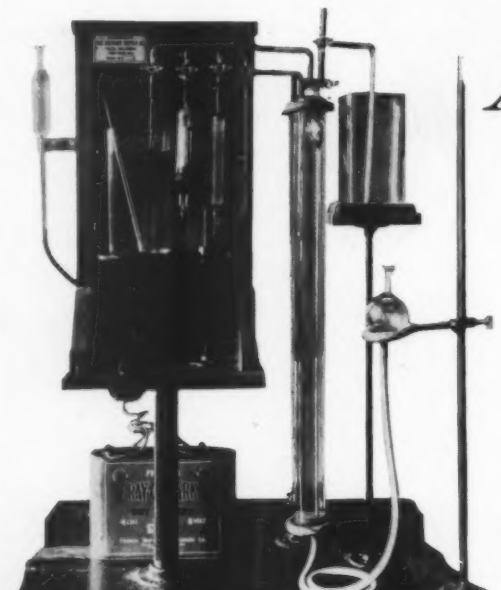

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North Texas Natural Gasoline Production Less This Year

Fort Worth, Texas.—Shipments of natural gasoline from the various manufacturing centers in North and Central West Texas during the first six months of 1925 amounted to a total of 98,143,794 gallons, or an average of 16,357,299 gallons per month. A comparison of natural gasoline shipments made from Texas during the first half of 1925, with the total for the corresponding period in 1924, reveals a decline of 6,944,742 gallons, and the slump is largely due to production being on the decline in Eastland County and in the Burkburnett field, while new territory invaded by the industry over the past year has not developed fast enough to offset a natural decline of the two oldest natural gasoline manufacturing centers in the state.

Eastland County plants are credited with having shipped approximately 42,546,462 gallons of natural gasoline during the first six months in 1925, as compared with 49,697,928 gallons during the corresponding period in 1924, or a difference of 7,151,466 gallons. This decline is largely due to the natural depletion of the gas pressure on the old established fields, while no appreciable volume of new gas has been made available for the plants to bolster their source of supply. The Burkburnett plant owners have been almost equally as hard hit by the normal exhaustion of gas supply, and shipped 5,851,440 gallons less during the first half of 1925 as was shipped during the first six months of 1924. However, natural gasoline plants in Stephens County came forward with an increase of 5,066,208 gallons during the first half of 1925, as compared with the same period in 1924, while the expansion of the industry to virgin fields in Reagan and Archer Counties also served to partially offset the decline sustained by plants in Eastland County and the Burkburnett field.

Market conditions on natural gasoline so far this summer have strengthened the financial position of the plant owners and considerable aggressiveness has been displayed in going after new gas contracts for old plants, as well as for the construction of new plants. Phillips Petroleum Company is erecting two small plants in Archer County, while The Texas Company already has one plant in operation in the lower part of the county, with plans being formulated for the enlargement of present facilities. Phillips is also running about four miles of 10-inch line from its plants at Pioneer, Eastland County, to fiulfill gas contracts obtained recently in the Cross-Cut field, Brown County. Two plants, which will be equipped with the Newton process, will be in operation shortly near Necessity, Stephens County, while a similar type of plant is being constructed in the Waskom field, located on the Texas-Louisiana line. Barney Carter and others are erecting a large absorption plant in the Barney Carter pool, Stephens County.

Shipments of natural gasoline from the various manufacturing centers in Texas during May and June, with totals for the first six months in 1925, follows (figures in barrels):

Fields—	May	June	Totals 1st ½ 1925
Eastland Co.	160,985	172,156	1,013 011
Stephens Co.	139,700	140,640	798,195
Burkburnett	35,790	36,050	224,975
Shackelford Co.	17,360	16,395	99.050
Electra	17,075	15,361	92,591
Young Co.	11,025	19,170	67,265
Petrolia	4,755	4,725	27,680
Potter Co.	1,065	920	5,700
Brown Co.	975	955	3,915
Reagan Co.	895	1,170	2,065
Archer Co.	385	1,925	2,310
Totals	390,010	409,467	2,336,757

Dixie Company Building Gasoline Plant at Caddo

Shreveport, La.—The Dixie Oil Company will award contract sometime this month for the construction of a natural gasoline manufacturing plant to be operated in conjunction with drips now in use on its so-called "gasoline-well" located about two miles from Oil City, Louisiana. This well has been producing for about one year, and is making 25,000,000 cubic feet of wet gas daily with a back pressure of about 400 pounds applied. The present installation of drips hooked up to the well are yielding from 2500 to 3000 gallons of gasoline daily, and these drips will remain in operation, while the gasoline plant is expected to afford an additional gasoline yield of about three-tenths of a gallon per thousand. The absorption process is to be used in the proposed plant, which will have a maximum capacity of 25,000,000 cubic feet of gas daily.

The Ohio Oil Company is reported to be contemplating a change in the present operating plan of its natural gasoline plants in the Haynesville field, and is gathering cost estimates on the necessary equipment to revamp these plants.

Phillips Building Third Plant

Wichita Falls, Texas.—The Phillips Petroleum Company has purchased materials for the construction of a second natural gasoline plant in Archer County, making a total of three plants for the county. Phillips has a small compression plant on its leases in the Wilmot-Wilson field, and will build a compression plant capable of handling about 1,500,000 cubic feet of low pressure gas daily in the Swastika-Harmel district in Southwest Archer County, where gas contracts have been made with producers. The Texas Company recently started operating the first plant in the county which is located in the Ragle pool, and making between 2500 and 3000 gallons daily.

Refinery for Seattle

Los Angeles, Calif.—The Olympic Calpet Refining Company has been formed by the interests controlling the California Petroleum Corporation and several large shipping interests, and a refinery is to be erected on fourteen acres of land at Smith Cove, Seattle, Wash., thus indicating to many that the California Petroleum is preparing to make a big effort to secure a large part of the petroleum business in the Northwest. Interests involved in the organization, in addition to the California Petroleum, are Admiral Line Steamship Company, Puget Sound Navigation Company and Henry Fleishacker of San Francisco, who with his associates recently purchased the Pacific Mail Steamship Company. This will be the first refinery at Seattle, and the crude run will come from California in tankers.

Empire Building Plant

The Empire Gasoline Company has purchased a plant site and ordered equipment for a new high-pressure absorption natural gasoline plant, to be located two miles east of Wellington, on the Santa Fe Railroad.

The plant will be designed for 6000 gallons daily capacity, and will have a capacity of 16,000,000 cubic feet of gas per day. All of the equipment will be of the latest and most efficient design, and the entire layout will have considerable flexibility. The construction work will be rushed to completion as fast as possible and operations started the latter part of August.

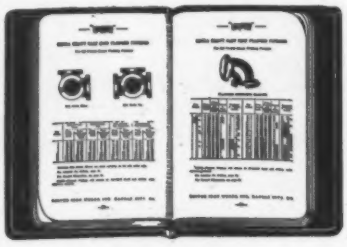
New Department

Los Angeles.—A department for the collection, conservation and processing of casing-head gas and gasoline and the marketing of the resultant natural gas has been established by the Standard Oil Company of California.

Work of this department which is known as the Casing-head Gasoline Department, was handled formerly by the production department.

R. A. Halloran, who has been associated with refinery operations for a number of years, has been appointed manager of the department, while Ross McCollum, formerly chief chemist of the producing department, has been named assistant manager.

Among other things, activities of the Casing-head Department include the operation of 11 compression and absorption plants in Southern California fields and nine in the San Joaquin Valley.



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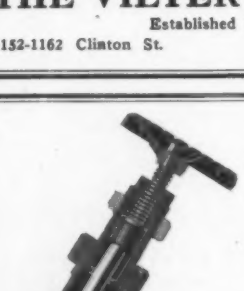

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Building Gasoline Plants

Los Angeles, Calif., June 20.—Four natural gasoline plants are being erected in the Inglewood field in the Baldwin Hills just south of Los Angeles. The Pacific Gasoline Company's plant will have a capacity of around 10,000,000 cubic feet of gas daily, while Petroleum Securities' plant will be able to handle around 6,000,000 cubic feet of gas daily. Shell Company and Standard Oil Company plants will each be able to handle at least 2,000,000 cubic feet of gas daily. The Inglewood gas has a gasoline content of slightly less than one gallon to the 1000 cubic feet.

To Build Plant

Breckenridge, Texas.—Barney Carter and associates of Ranger, Texas, are placing orders for equipment to erect an absorption gasoline manufacturing plant in the Carter field in Stephens County. The plant will handle about four million cubic feet of gas daily, and the gas being produced in the Carter field ranges from two to three gallons per thousand. R. W. Thomas is in charge of buying the materials and erecting the plant.

Installing Stoker

Freedom, Penna.—The Freedom Oil Cowks Co., has placed contract for the installation of a mechanical stoker, to be used in connection with one of the oil stills.

The new equipment will include a Detroit Single Retort Underfeed Stoker, and a special fan, which will be mounted below the ram case of the stoker. This fan will be direct connected to a 5 h. p. alternating current motor. By means of a silent chain drive and sprockets this motor will also operate the stoker.

To Enlarge Plant

Ranger, Texas. — The sale of the Dixie Gasoline Company's natural gasoline plant in upper Brown County to the Olympia Oil & Refining Company of Chicago, Illinois, on June 18 will result in the plant being enlarged. This plant is the only one in the country and is manufacturing about 1500 gallons of absorption gasoline daily. All gas contracts held by the Dixie Company have been assigned to the new owners, as well as leases on about 1000 acres of land, which is partially proven for gas production.

Carl F. Braun, president of C. F. Braun & Company of Alhambra, California, with offices at Tulsa, is spending several months abroad studying European and Asiatic oil refining methods. His firm enjoys a large export business of heat exchangers and natural gasoline recovery apparatus.

Humble Buys Plant

Breckenridge, Texas.—Humble Oil and Refining Company has purchased the J-T Gasoline Company's absorption gasoline manufacturing plant located on the E. C. Ward land near Breckenridge for a cash consideration of $75,000. This plant was built and controlled by the Hope Engineering and Supply Company, and is turning out an average of 2200 gallons of gasoline daily. Humble purchased two other gasoline plants last February from Hope for $1,125,000, and the combined daily output of these three plants is now in excess of 40,000 gallons.

Paint Line Added

The Ward Chemical Company, 226 Atco building, Tulsa, Oklahoma, has added a refinery and natural gasoline plant paint to its line of products. It is known as "Ward's High Heat Paint," being compounded to resist intense temperatures from both refinery practice and the sun. It is also offered as a paint capable of standing the sudden changes in the elements.

One of the fractionating towers of the Mid-Continent Petroleum Corporation's plant in West Tulsa has been painted with the product, giving results gratifying to its management.

Sherwin-Williams Service

As part of its service to the oil industry, the Sherwin-Williams Company has issued a volume under the title, "Metal Protective Finishes for the Petroleum Industry." This volume takes up the question of painting from every angle of production, refining and shipping of oil.

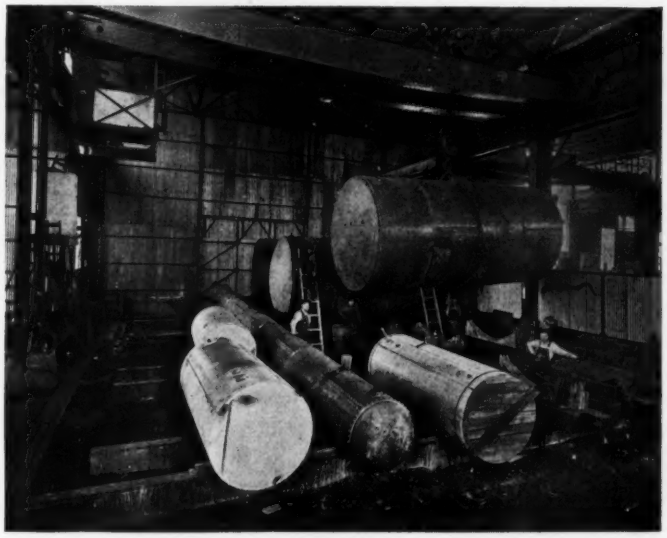
Literature divides the purpose of painting in the oil industry into three divisions, appearance, protection and the prevention of evaporation. The volume was compiled from data supplied by chemists and engineers of the company as well as information collected by the Bureau of Mines.

A copy will be sent to any interested person by requesting the home office at Cleveland or any of the branch offices in the cities of the oil territory.

McDonald Swing Joints to Argentine

The Bethlehem Steel Company has just purchased several hundred three and four-inch McDonald Swing Joints for shipment to the Argentine Republic. They will be used in connection with a refinery being constructed by this company.

Los Angeles, Calif.—The Hills-McCanna Co. of Chicago is now represented on the Pacific Coast by Guy L. Warden and A. R. Chandler, whose headquarters are in the Pacific Electric building, 610 South Main Street.



View of Wyatt's Test Floor

The reputation a manufacturer has with his trade is built upon character. If the reputation is good the character of the organization in its adminstration, its operatives and its physical equipment will be found to be of the best. The purpose and will to do good work may be inherent but without the facilities the results will be unsatisfactory.

The facilities for testing shown in the above cut are representative of the care and thought that have been given to the equipment of the entire shop for building up the excellent reputation which this company enjoys thruout the entire Southwest in every branch of the Oil Industry where plate work is used.

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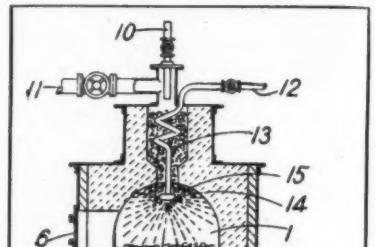
Extracts From Refinery Technology

Heat of wetting of metal by oils and lubricating power.—Measurement has been made by means of a sensitive platinum resistance thermometer of the heat that is liberated on wetting finely divided copper, which is prepared by reducing copper oxide, with liquids of varied lubricating power. Oils of high lubricating power have much lower heats of wetting. Thus the heats of wetting in calories per hundred grams of copper were castor oil 12.1, linseed oil 13.8, a distilled machine oil 14.3, a refined machine oil 6.3 and liquid paraffine 3.85. These value were calculated for the pure oil from experiments in which the oil was diluted with half its weight of benzine to reduce the viscosity, it having been shown that benzene had a very low heat of wetting. Petroleum without benzene gave 5.7 and the addition of one per cent of oleic acid increased the value to 21.3. Kolloid Zeitung, 125, 36, pages 142.-54.

Distilling mineral oils.—The solid fuel that is required for the process is burned in a separate furnace under such conditions that the combustion products are substantially free from oxygen. The gas is diluted with the colder gas such as that which has been passed through the still and the mixture is then intimately mixed with the oil in the still. The oil may be sprayed into the gases or distributed over packing material and instantaneously vaporized. The gas and oil then pass to a series of fractional condensers in which the vapors are washed with the corresponding condensate. The gas from the last condenser passes to a scrubber where it is washed with heavy oil to recover any light spirit. The advantage of this process is the saving in fuel consumption. If superheated steam is used as the distilling medium, only about twenty-three percent of the total heat is available for the evaporation, but by using hot combustion gases about 80 per cent of the total heat is available. British Patent No. 232,347.

Cracking shale or petroleum oils.—The apparatus which is shown in the accompanying illustration is used for the purpose of cracking or hydrogenating shale or petroleum oils or naphthalene oils, anthracene oils and the like. The oil is atomized by coming in contact with a downwardly directed flaming zone of gaseous combustion. The products pass downward through a packing of solid material which assists the chemical changes in taking place. The liquid may be mixed with finely divided catalytic material such as kieselgurh which has been impregnated with nickel. Steam may be injected into the vaporized material.

The chamber 1, in the accompanying illustration, has a firebrick lining, 2, and an insulating layer, 3, and is partly filled with carbon, 5, which is impregnated with a catalyst. Combustible gas is passed in through a pipe, 10, and air through a pipe, 11. The oil to be treated is passed in through a pipe, 12, and is sprayed at 15, where it meets a zone of hot gas generated by surface combustion in a mass of corborundum, 13. The combustion products and cracked oil pass out through an outlet, 16, to a dephlegmator, 18, where the heavier oils are washed out, and the vapor passes on to a condenser. The condensate may be fractionated and the vapor passed through a scrubber. In a modification a hydrogenating gas may also be passed into the chamber 1.



Making hydrocarbon liquids and gases.—Fuel oils and other heavy oils and fats, which may be animal, vegetable, or mineral, are heated with cerium oxide and reduced copper to a temperature between 450 and 600 degrees C and then with thorium oxide and reduced nickel at the same temperature. A hydrocarbon liquid is condensed from the vapor by cooling to a temperature of 30 degrees C and the remaining vapor is treated with iron oxide and reduced nickel heated to a temperature of 200 degrees C. A further condensate is then obtained at 15 degrees C and the remaining vapor is treated with iron oxide and reduced iron at a temperature between 250 and 300 degrees C. Another condensate is obtained at 10 degrees C and the remaining gas is used for lighting and heating. British Patent No. 231,159.

Distillation of petroleum with inert gases.—It has often been proposed to distill petroleum in a stream of an inert gas in the place of steam and various processes have been worked out along these linees. The question remains of course what is the nature of the action of the distillation on the

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character of the products that are formed. Investigations were accordingly undertaken with this purpose in mind and the distillation was carried out with the aid of steam superheated to a temperature of 250 degrees, with gas, oil gas and flue gas.

The results that are obtained when oil gas is employed, which is injected into the still either in the hot or cold condition, are much better than those that are obtained in the steam distillation of the petroleum. The density of the products obtained, their flash temperature and viscosity are much higher than otherwise, which indicates that the decomposition of the distillates has been less.

On the other hand when flue gases are employed for this purpose—that is flue gases which contain from 0.7 to 3 per cent of oxygen—oxidation of the distillates as well as of the residual matters in the still ensues and water is formed. A curious fact is that the acidity of the distillate is not any greater in this case than when oil gas is used for the distillation, and the acidity is greatest when steam is used in the distillation process. Brennstoff Chemie, volume 20, pages 323-3.

Colloidal phenomena in petroleum operations.—Many colloidal phenomena are encountered in the refining of petroleum and petroleum products. Colloid chemistry enters into the petroleum industry right in the oil fields themselves where emulsions of oil and water and asphaltic bodies have to be handled. Various methods are used in separating these emulsions. Bottom settlings in tanks and pipes are closely allied with these oil emulsions and very often consist of one per cent of clay, 17.9 per cent of asphalt insoluble in petroleum ether and 59.6 percent of amorphous waxes. For a long time that sort of emulsion was dumped into the sea but now it is effectively broken up and recovered by super-centrifuging.

In the ordinary process of distillation a distillate was obtained which was of a colloidal character, and was ascribed to the presence of tar fog which had been brought over from the stills to the condensing system into the receiver. That tar fog was generally finely dispersed asphalt in the oil vapors and was a matter of great difficulty to remove effectively. It could be done by effective scrubbing and centrifugal action, but was more frequently removed by treatment with ordinary sulphuric acid. Recent work, however, has shown that this could be more completely carried out by the use of such materials as bauxite, silica gel and Fuller's earth.

In the distillation process also there were often obtained persistent emulsions of water in oil due to the dispersion of the condensed water accompanying the oil, and such persistent emulsions could be broken up by filtration or by the effect of heat, pressure, or standing. Still more difficult

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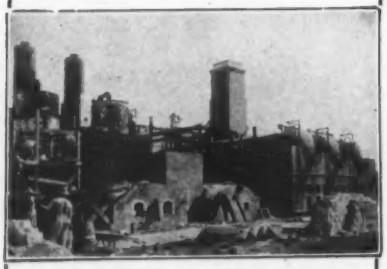

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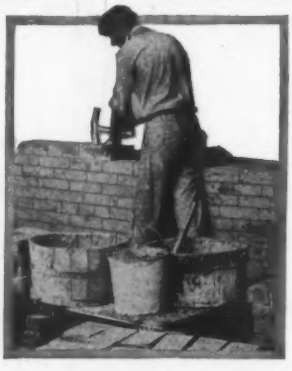

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emulsions are frequently met with in the ordinary refining operations and a very familiar method of removing sulphur compounds was the agitation of the sulphur containing oil with a solution of litharge and sodium hydroxide. The use of a small amount of flowers of sulphur was also effective. Emulsions of water in oil were stabilized by the action of sodium hydroxide on the acids present in the petroleum distillate, but such emulsions caused trouble owing to their extreme reluctance to flocculate.

Taken from an address delivered before the Society of Chemical Industry in London and abstracted in The Chemical Age of London, 1925, page 583.

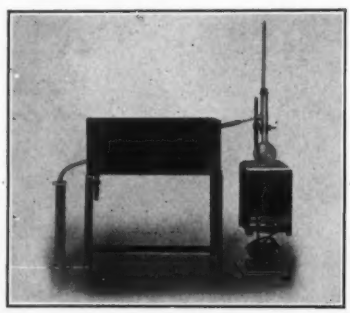
Lubricating oils.—The chief desirable qualities of lubricating oils are oiliness, viscosity, physical stability and chemical stability. In a paper which was published in the Journal of the Institute of Petroleum Technology, 1925, pages 177-190, the testing of lubricating oil is described and certain modifications are mentioned. One change in the usual sludging test is to decrease the time from 45 to 6 hours, omitting the use of copper foil and raising the temperature from 150 to 170 degrees C and using oxygen in the place of air. The results that are obtained in this manner are generally in a constant ratio to those of the standard test. Small quantities of substances such as dust, copper oxide, etc., increase the amount of asphalt that is formed in this test to a very large degree. For example the percentage may be increased from 0.91 percent to 4.13 percent by the addition of 0.1 percent of ordinary dust.

Another research was also described in the article and this had to do with the composition of lubricating oil constituents of petroleum before and after distillation. The object of this experiment was the separation of two or three homologous series of hydrocarbons at room temperature. The oil used in the experiments was a Burmah crude. Various extracts were made with the aid of a solution of sulphur dioxide in acetone and the extracts and residuals were analyzed to obtain their ultimate composition, while the specific gravity, color, viscosity and oxidation-capacity of the various extracts were determined. Then theoretical formula were calculated for these oils.

Gasoline-Alcohol Fuel.—Equal volumes of 95 percent alcohol and commercial hydrocarbons such as a low grade gasoline are placed in a still which is fitted with a fractionating column and analyzer. On raising the temperature vapors pass through the column to the analyzer which is maintained at a temperature of 58 to 65 degrees C and effects a partial separation. Condensate from the analyzer (dephlegmator) is returned to the fractionating tower while the vapors are passed through a condenser to a tank fitted with a gauge glass. The condensate separates into two layers, the lower being aqueous alcohol which is run off and after dilution to remove gasoline is again brought up to 95 percent concentration.

The first small fraction up to five per cent does not require any separation but the fraction coming over above 60 degrees C requires separation. British Patent No. 232,276.

The Duriorn Company, Inc., of Dayton, Ohio, has named two representatives within the oil industry. The Mid-Continent territory is being cared for by Edward Soph, 124 West Third street. His territory includes Oklahoma, Kansas, North Texas and Arkansas. M. B. Crowe, 4001 Caroline boulevard, is handling products of the company in South Texas.



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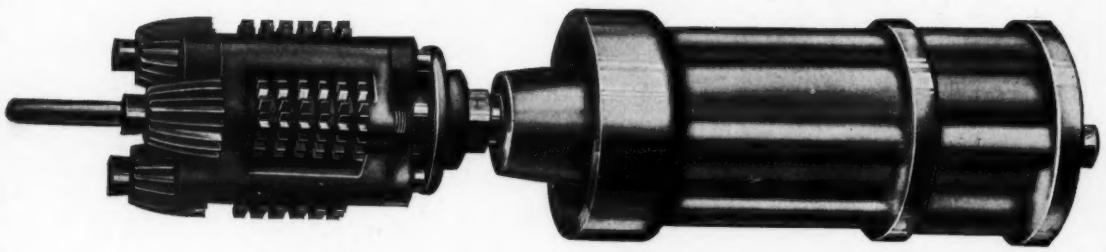

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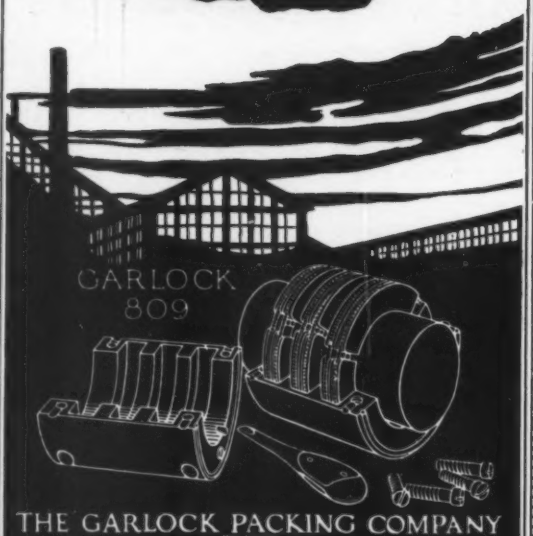

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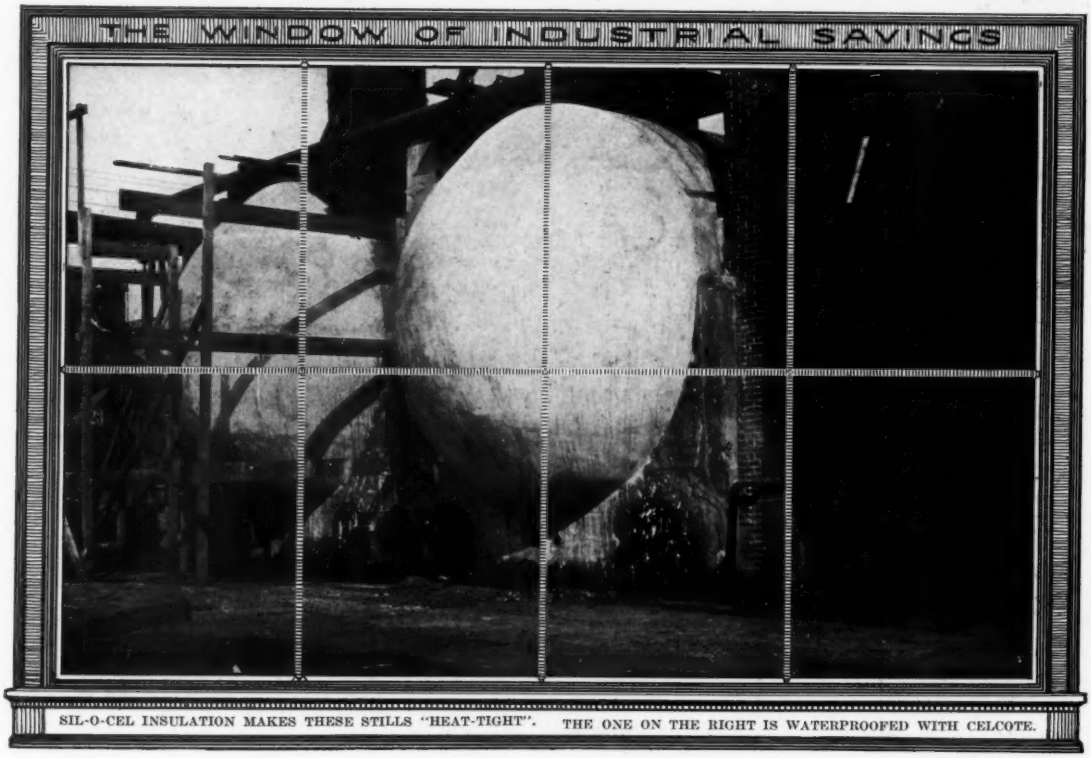

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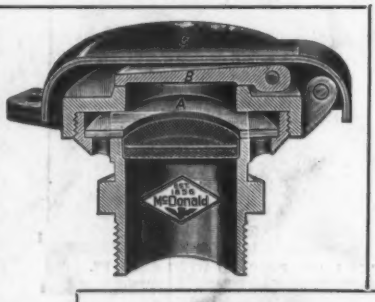

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